

CENTRAL AND EASTERN EUROPEAN LABOR MOBILITY TO THE EU15  
COUNTRIES BEFORE AND AFTER EUROPEAN UNION ACCESSION

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Abstract: Central and Eastern European Labor Mobility to the EU15 Countries Before and After European Union Accession

Despite the fact that European Union member-state politicians are committed by Treaty of Rome obligations to make intra-EU freedom of production factor movement a central goal of their economic development plans, many of those same politicians have reacted negatively in the past to the anticipated waves of poorer-country workers who they believe would shift residences once their economies have joined the EU. During the enlargement round of the 2000s, many EU15 governments insisted upon and took advantage of derogations in the new member-states' accession treaties that allowed the older members to delay the free movement of CEEC10 workers for up to seven years. This action was taken despite several reputable studies sponsored by the European Commission and various think tanks that indicated that the size of CEEC10 worker movement would be modest at most. The goal of this analysis is to test the plausibility of these forecasts and to determine whether the EU15 governments should have expended the political capital necessary to negotiate and implement this derogation. Using the generalized least squares statistical technique, this research establishes that while economic factors and certain policies do influence migration rates, network theory variables and the implementation of a free migration policy do not. This outcome implies that member states that wish to limit initial poor-country worker migration to their economies would be better-served by channeling their efforts into EU cohesion policy and others that encourage intra-EU economic growth. It also suggests that the free worker migration derogation should be omitted from future accession treaties except perhaps as a psychological balm for receiver-country workers. Additionally, several migration projections using the GLS estimators (with no country-specific estimators) and an under-utilized technique called systems modeling are forecast here under a variety of policy conditions. The results of these projections indicate that the modest consensus forecasts conducted in the run-up to CEEC10 accession were reasonable and perhaps even a bit high.

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## Chapter 1: Introduction

*Background*--Worker mobility within the European Union (EU) has been a serious concern for EU policymakers and politicians from the earliest days of the organization. In fact, the group's foundational document, the 1957 Treaty of Rome, asserted that a primary goal<sup>1</sup> of the EU would be to guarantee the gradual, but eventual, unfettered movement of goods, services, capital and labor (the "four freedoms") throughout Western Europe. Out of the four freedoms, the one that has encountered the most resistance in its implementation is that of labor. Generally, politicians know that they would experience many more political difficulties if they were to advocate an open market in labor<sup>2</sup> in addition to that of goods and services. Their hope in pushing for the latter is that these politicians' economies could enjoy the benefits of free trade without suffering the greater political costs of opening their labor markets to foreign workers (Schulze, 9-10, 211-214; Pritchett, 9, 12; Tsoukalis, 230-233). In the EU's case, the political barriers to labor mobility were in fact among the last<sup>3</sup> to be dismantled in the quest for a single market.

An enormous challenge to the concept of free worker mobility within the European Union was present during the preparations for the accession of eight CEE candidate countries in 2004 and two more<sup>4</sup> in 2007. These potential member states were considerably poorer than even the poorest EU15<sup>5</sup> country; in fact, the economic gap between these countries and the rest of the EU was wider<sup>6</sup> than had been the case in any earlier enlargement (Poole, 12-13; McCormick, 172-173). Many politicians and members of the public in the EU15 states were therefore quite concerned in the years immediately preceding these accessions that workers from the CEE states would try to access their labor markets as soon as they could take advantage of the EU's policy of free mobility

(Kunz and Leinonen, 148; Maas, 40, 78-83). At first glance, this anxiety is not an unreasonable one, as neo-classical economic theories of migration posit that a primary determinant of this phenomenon is income differentials between the labor sender and receiver countries (Massey et. al. 1993, 434-435). In the end, this reservation led EU negotiators to include in every CEE accession treaty a derogation on the unfettered movement of workers from all of those countries. That clause allowed older member states to maintain limits on CEE workers for up to seven years after their homelands' accession (van den Bogaert, 59-61). Although the governments of the CEE countries chafed at the perceived slight of being treated as second-class citizens within the EU, and because the derogations cost the EU15 delegations extensive political capital in their negotiation and implementation, negotiators for the CEE countries recognized that these limits<sup>7</sup> were part of the price of admission and reluctantly consented to them (Dinan 2005, 152, 574; Sedelmeier, 424; Rees, 220-222). The EU15 countries were not required to adopt the labor mobility derogation, but only three of them did not implement it for the 2004 entrants (Gilpin et. al. 3; Lord Wright, 15) and only two did not<sup>8</sup> for the 2007 new member states (BBC News 2007).

However, should the EU15 governments have concerned themselves with a flood of labor migrants from Central and Eastern Europe arriving on their doorsteps as soon as the ink was dry on the accession documents? Previous enlargements involving poorer European countries, most famously the southern enlargements of the 1980s, did not create such movements despite grave warnings to the contrary (Salt et. al., 43-48; van der Mei, 120-121; Tassinopoulos et. al., 23; Boeri and Brücker 2000, 119). In order to tamp down the expected large-scale worker movements from Southern Europe (Greece, Spain

and Portugal) to the rest of the EU, the organization spent a great deal of money on cohesion programs in these newly accessioned member states. The expenditure of these funds, which are designed to increase the level of prosperity in lagging areas to EU norms, is aligned with the arguments of neo-classical economic theories of migration that state that it may be prevented or limited by raising the average income of people in the donor areas (Massey et. al. 1993, 434-436). In addition, the same derogations for the free movement of labor that would be so disliked by the prospective CEE member-state governments were first applied to Greek, Spanish and Portuguese workers in the 1980s (Dinan 2005, 373-384; Poole, 25; R. King, 114; Bauer and Zimmermann, 44; Salt et. al., 43). However, despite the continuing relative impoverishment<sup>9</sup> of many places that receive cohesion money and the long-past expiration of these labor mobility derogations, worker movement from Southern Europe to the rest of the EU has been rather limited in scope (Dinan 2005, 382-383; Tassinopoulos et. al., 23).

Another piece of evidence that might have reduced the anxieties<sup>10</sup> of these governments and their citizens on this score is the fact that most (although not all) of the academic and official EU predictions of CEE member-state labor mobility contend that the expected number of workers from these places should be relatively modest at worst, even in the long run (Salt et. al. 6-7; Boeri and Brücker 2005, 11). These studies are explored in considerable detail in the literature review, but it should be noted here that these reasonable estimates of worker movement failed to prevent many policymakers from speaking out against free CEE worker mobility. Finally, it is well-known in EU policymaking circles that less than two percent of European Union workers, including those from the poorer regions of the EU, work in member states other than where they are

citizens (Cremers and Donders, 11; Biffi, 159; Veil, 10; Lord Wright, 34; Krueger, 5-8).

The European Commission is disappointed by this small figure<sup>11</sup> because it indicates to them that there exist barriers to the free movement of workers<sup>12</sup> that are not being adequately addressed (Schumacher; Tassinopoulos et. al., 21-25; Recchi, 71). The very existence of this small percentage<sup>13</sup> despite the considerable policy pressures to produce a contrary result could have been an indication to EU15 politicians that the post-accession mass movement of CEE workers to their economies would be extremely unlikely.

*The Problem*--In short, it seems that we have an interesting political-psychological question here: how can we explain the enormous concern that free CEE member-state labor mobility wrought in many EU15 countries when most of the reliable historical and predictive indicators are pointing in the opposite direction of these worries (Doyle et. al., 8-9; Salt et. al., 46, 96)? However, there are two even more fascinating puzzles that are related to this one that must be tackled before it can be addressed. First, how many CEE workers could politicians in the EU15 governments have reasonably expected and can they expect to move in the future? This total includes not just the workers whose countries gained admittance to the EU in 2004, but also workers from the states that joined in 2007 and from countries that are likely to join in the decades to come. Second, what policies should EU politicians have adopted with reference to these workers in the past and what should they do for CEE countries that complete the accession process in the future? As has already been shown, the adoption of derogations on the question of free labor movement for CEE workers created considerable tension within the organization that may not have been worth their purported benefits. In short, it is these two basic questions that this research hopes to address in immense detail, and which

should permit it eventually to legitimately tackle the original question that begins this paragraph.

In order to evaluate the issue of what policies EU governments should adopt in relation to new member-state workers, this contribution must attempt to resolve some discrepancies in the literature concerning CEE worker mobility predictions and test a new combination of theories of migration that may lead to a more generalizable picture of this phenomenon. Many of the models of CEE labor migration forecast that between two and four percent of the total population of the ten prospective CEE countries would leave home and take up residence in the EU15 states in the long term (Krieger, 18; Boeri and Brücker 2005, 11). However, a considerable number of these projections state that a smaller (Dustmann et. al., 2003) or larger (Sinn et. al., 2001) number of CEE labor migrants should have been expected by the governments of the EU15 member states. Although one might expect there to be an array of values predicted for this movement given the nature of this exercise and the different methodologies in use here, a range whose scope stretches from under one to almost fifteen percent of the CEE states' population requires some clarification. If this work can conclude using various data-driven (not formal or hypothetical) models of this phenomenon that one particular set of projections is the most valid, it will have contributed something to the debate over CEE labor movement by demonstrating what the probability of mass migration of CEEC10 workers was at the time of their accession and what the likelihood of future poorer-country workers might be in the future.

The current research also aims to advance the broader literature on migration in addition to dealing with the specific question of CEE worker mobility. There are a

number of competing and complementary explanations for migration in the literature (Massey et. al. 1993; Massey et. al. 1998), but there is no single widely-accepted theory of why this important human behavior takes place. In constructing the present models of CEE labor migration, the complementarity and explanatory value of several migration theories are explored in some detail. A number of methodological tools are also utilized in this research, including statistical modeling, systems modeling and the case study method. This diversity of methodological tools should allow for stronger conclusions to be drawn about this study's research questions and hopefully permit a more substantial addition to the literature to be made here. In all cases, these inferences are drawn from the outcomes of various data-driven, rather than formal, models of migration.

*Research Questions*--Although parts of what this project wishes to explicate have been hinted at above, more formal statements of these research questions can be clustered into two groups here.

*Locus 1:* How many workers, and what types of workers, could EU15 leaders have expected to take positions in their countries after the enlargements of the mid-2000s, given different conditions that could affect their mobility? How many labor migrants might the EU15 countries expect to receive from these new member states in the future? What are the dynamics of internal labor migration within the European Union?

*Locus 2:* Given these figures and dynamics, what policies should EU member states develop individually and collectively to address the opportunities and difficulties presented by new streams of labor migration created by the accession of new member states? What policies are effective and ineffective at influencing how many workers change their country of residence?

The first collection of research questions covers issues such as what political, economic and policy features of the CEEC10 drive workers from home to their new workplaces, where specifically from within that group of countries they would hail, and the barriers that might prevent these workers from moving. The relationships defined by this group of

questions are elucidated in explicit detail in a series of hypothesis statements in the statistical modeling sections of this research. In a later part of this contribution, these hypotheses also form the endoskeleton of the systems models' structures. Many of these hypotheses are grounded in the neo-classical economic explanations for worker migration discussed in the literature review chapter of this research, although others are derived from historical-structural and network migration theories as well. The selection of economic theories of migration as a major source of testable hypotheses has been a common strategy in previous studies of these questions, but political and policy variables are added here to address Kupiszewski's (2002, 637-638) criticism that non-economic determinants of migration have generally been ignored in the past. Additionally, the inclusion of political and policy variables helps to maintain this research's focus on the political, rather than the strictly economic, features of labor migration. This approach follows from an assumption that EU member-state governments are able to create and implement policies that can encourage or discourage labor migrants from entering their economies. Politicians and their public policies must be able to limit or promote economic migration to their countries or else the second group of research questions would be moot. In short, exploring the kinds of policies and traits of governmental systems that accomplish these goals is a featured part of all facets of this modeling exercise.

*Chapter Overview*--The background to the political and policy problems of CEE labor migration to the EU15 countries and thus the research questions that this dissertation explores has been fairly well explicated above. Therefore, the next step in this narrative is to elucidate the foundational assumptions upon which this contribution rests. In other

words, how does this study expect labor migrants, and the politicians and policymakers who must manage the consequences of their interstate movement, to react given the real-world incentives and constraints that shape their perceptions of their economic, social and political environments? Hopefully, this section illuminates these matters in a satisfactory fashion as they guide much of the model construction and discussion that follows.

Although a fuller examination of the methodological details of this study must wait until the appropriate empirical research chapters, the next portion of this chapter provides an outline of how it proceeds. A brief synopsis of the complete research endeavor and its broader implications to the discipline and the migration literature is then attempted. Finally, a preliminary taxonomy of modeling in political science is appended to this chapter as the setting for this study's use of these powerful research tools.

**Operative Theoretical Expectations:**

*Political and Behavioral Expectations*--The above introductory comments and brief presentation of the research problem serve as the background which this study employs to approach its topic. In particular, this research takes as its initial standpoint that workers are not as mobile as many academics, politicians and members of the EU15 public seem to believe they are (Massey et. al. 1998, 8; Martin and Taylor, 97-98; Zolberg 1983, 239; but see Zelinsky, 223-225; Ghosh, 97). For example, the most basic version of the micro-level neo-classical economic model of migration (Massey et. al. 1993, 434-436; Massey et. al. 1998, 18-21; Todaro, 141) asserts that an individual<sup>14</sup> worker's decision to change locations is directly related to his expected rate of return on this choice. This anticipated amount is a function of the average earnings differential between his home and destination countries, weighted by the migrant's chances of finding employment in each

place and the likelihood of his deportation from the target country, and a constant term. This constant term denotes the total transaction costs of changing economies, including the non-economic and psychological barriers that disincentivize migration from one economy to another (Massey et. al. 1998, 20; Straubhaar 1993, 11-12).

A difficulty here, however, is that the final term in the migration decision equation is probably much larger than some politicians and researchers implicitly presume (Straubhaar 1986, 837-839). There appears to be a tendency among EU politicians and citizens to overestimate the pull factors<sup>15</sup> that attract poorer member-state workers to their countries and make the same mistake with the push factors that impel them to leave home. Large-scale movements of workers do occur (Hatton and Williamson), and mobility is induced by items such as economic differences between countries, including in their unemployment and wage rates (Massey et. al. 1998, 123-125), but massive shifts are created by much larger disparities than is commonly supposed. Language differences, skills incompatibilities, distance, and simple inertia (Lee, 51; Piore, 17; but see Brücker and Damelang, 9-11) are not insignificant barriers to movement, but they are systematically discounted in some politicians' evaluations and policy analysts' investigations of this phenomenon. Potential foreign labor migrants also have considerable psychological attachments to their home countries that must be overcome before they can be induced to move, a fact that is at times neglected by individuals who are concerned about the effects of worker migration. Additionally, there are institutional and bureaucratic barriers that make it costly to move from one location to another to take a job, even in an open labor market economy (Karras and Chiswick, 659; Wallace 2002, 614-617; Böhning, 36-37; Lucas, 87).

A defense of the idea that workers are less itinerant than is sometimes presumed raises the related matter of why some members of the public and their politicians continue to operate as if poor-country workers are quite mobile. While some EU15 politicians and their voters may sincerely believe that their economies are threatened by large-scale worker movement after the EU admits members from poorer parts of Europe, an argument could be made that these individuals might instead know that large-scale movements of poorer member-state workers are unlikely. However, the potential negative effects of mass migration are so great, especially for economically vulnerable host-country workers, that even if the chances of these consequences happening are low, receiver-state citizens demand safeguards of their politicians anyway. In addition, the threat of intra-EU labor migration could be used by wealthy-country employers to extract wage concessions from their workers. If that menace were removed through the imposition of governmental limits on poor-country workers, EU15 employers would be unable to play that stratagem against their employees. Rational democratic politicians comprehend these pressures and, because they want to stay in office (Geddes, 7-8), would behave publicly as if they believed that foreign workers were easily mobile, even if they thought differently, and accede to their voters' demands. Politicians who genuinely supported new member-state worker restrictions might also use an exaggerated domestic backlash threat as a bargaining tool in accession negotiations. In other words, EU politicians and their publics may be constrained by economic and political forces to act in ways that may be contrary to this situation's reality, their beliefs, and perhaps the long-term best interests of their countries (Zolberg 1983, 230-231, 244).

Even taking these arguments into consideration, however, much of the political concern about CEE labor migration to the EU15 countries does not appear to be warranted since it seems to be based on the assumption that relatively small economic disparities between countries lead to massive interstate worker movements (Kupiszewski, 642). The preliminary evidence cited in this chapter's introductory comments seems to support the low worker mobility position, however. Multiple prior instances of the EU admitting poorer member states never created the level of worker migration<sup>16</sup> that the relatively low consensus figure from prior studies (Boeri and Brücker 2005, 11) of this question of two to four percent of the CEE countries' population would imply (Salt et. al., 43-48). While it is true that the CEE states are poorer relative to the rest of the European Union than any previous enlargement countries were, the movement of four percent of one country's population to another in peacetime (Kupiszewski, 630-633), even in the long run, would create considerable countervailing political pressures in the sender and receiver countries to limit that movement. It seems unlikely that EU15 member-state politicians would not react to this level of migration given the demands of their constituents in this area.

The question then becomes how this perspective affects the anticipated outcomes of this study and why that is important to the topic that is being explored here. The primary critical implication of the argument that individual workers are less mobile than sometimes believed is related to this issue's importance to the policies of the European Union and its member states. Should this research's contention that workers do not change locations easily be supported by the evidence, its conclusion will be that member-state politicians should learn from past experience<sup>17</sup> and not adopt restrictive policies

concerning future new member-state workers. That stated, the issue of CEE labor migration is likely to remain an important one for EU15 political figures for a long time to come because a considerable number of these politicians and members of their publics believe that a mass of CEE workers is currently swamping, or is likely in the near future to flood, their economies. It is therefore hoped that the results of the current research may shed some light<sup>18</sup> on the actual state of affairs in EU labor mobility and influence how academics and others view intra-EU labor migration. In terms of EU politics and policymaking as a whole, the implications of this expectation, if it is indeed supported, are more mixed. On the one hand, the discovery of evidence that only a relatively small number of CEE workers are likely to leave for the rest of the EU would justify the EU's overall position that worker mobility should be as free as it is for capital, goods and services. However, it would also mean that the EU's efforts to spur member-state workers to sell their services in countries outside their own would need to be enhanced. Just having a large number of poorer-country employees join the common labor market, in other words, is not going to induce more EU citizens to labor in places outside their country of origin.

*Policymaking Expectations*--Implicit in any discussion of EU labor migration policymaking are at least two important assumptions about how member-state policymakers behave concerning this issue and think about their ability to affect it on behalf of their constituents. The first conjecture is that EU member-state politicians adopt labor migration policies based in part on their anticipation of how many accession-country workers will be attracted to their economies in the future. This reactive stance implies that EU member-state politicians utilize forecasts of labor migration, their

understanding of how their constituents would respond to these calculations, and other domestic and international political considerations to determine their positions on free labor mobility. In general, the more workers who are predicted to move, the greater the pressures that exist on current member-state politicians to shield their labor markets from new member-state workers. It can be argued that there is some behavioral and rhetorical evidence to justify this particular supposition. For instance, the fact that this issue and the same arguments and political pressures surrounding it arise every time the EU is negotiating with poorer potential member states but do not when wealthier states are negotiating for entry convinces numerous observers of European politics that this notion is reasonable. However, the matter then becomes how many workers should these politicians expect to move, a central question of interest to this research.

The second assumption that resides within the preceding narrative is that politicians can in fact create policies that impact the number of non-native workers who take jobs in their national economies. This proactive stand on the effectiveness of labor-market policymaking is a natural one for politicians to take; after all, there would be little practical point in creating government policies that are unable to even affect the level of some social problem that the policies are meant to address. However, this notion is challenged by some studies (Doyle et. al., 11-12; Drew and Sriskandarajah; European Commission 2006, 14; Pritchett, 13-14) that assert, among other notions, that the underlying economic demand for labor in a market actually drives migration<sup>19</sup> and that politicians are hamstrung in their efforts to limit it. Initially, this line of reasoning might seem quite economically persuasive because it leaves the determinants of migration up to impersonal supply and demand forces. From a politically pro-migration point of view,

this argument is credible since it would encourage governments to adopt an unfettered labor market as official policy. However, it is apparent that this idea is not totally correct due to the labor migrant “deflection effect” described in some detail<sup>20</sup> in the literature review. On another but no less-important level, EU member-state politicians behave as if their policymaking influences the extent of labor migration to their countries. Even if the scholars who maintain that restrictive policymaking in this area is futile were completely correct, for domestic political reasons EU member-state politicians must continue to be seen as acting to limit the size and effects of labor migration on native workers. The operative question then becomes which policies are the most effective at achieving those goals, a matter on which this research comments at its overall conclusion.

**Plan of Action:**

A variety of investigative tools is utilized by the current study to explore the research questions posed in the introductory section. The purpose of this portion of this chapter is to give an initial indication of how these tools are utilized in this analysis; please see the appendix to this chapter for a background discussion of these methods. Statistical modeling, the case study method, and systems modeling are all utilized by this project to grant different perspectives on the questions surrounding the politics and policymaking of CEE labor mobility.

*Statistical Modeling*--The first of these instruments is statistical modeling (in particular, time-series modeling of pooled cross-sectional data), which is employed here to create forecast estimators for projecting future CEE labor migration. This strategy, which has been employed by many previous studies of this question (e.g., Zaiceva; Boeri and Brücker 2000; Fertig), consists of three distinct steps. In the first phase of this process, a

statistical examination of the proposed determinants of labor migration is completed to both confirm which variables have statistically significant relationships with the dependent variable (change in migration rate) and to create estimators that are then used to calculate future worker flows in a later stage. Although much more is explicated about these matters in the statistical modeling chapter of this work, it is vital to assert that several models are created here using net migration rate as the dependent variable and a number of economic (e.g., differences in unemployment and GDP rates), political and policy (e.g., regime type, political instability, the adoption of free labor mobility between countries) concepts<sup>21</sup> are utilized as independent variables. Two separate models, one using migration flow data from Southern Europe to Germany and another using the same type of data from a wider variety of countries to Germany over the same time period (the 1960s to just before CEEC8 accession in the mid-2000s), are formed to calculate the estimators that are necessary for the next phase of the process. This approach is somewhat different from how earlier scholars have addressed this question in terms of country and time period selection; in fact, this methodology represents a combination of tactics that have been exercised by the authors cited earlier in this paragraph and Bauer and Zimmermann (1999). Using a larger number of countries in the data set can avoid sample bias issues, but drawing exclusively on the history of Southern European emigration to forecast CEE emigration could lead to more accurate estimates of the latter phenomenon. Both strategies are pursued here in an attempt to obtain a variety of results and to allow for a direct comparison between the outcomes of both estimation strategies.

The second segment of the statistical forecasting procedure utilizes the estimators calculated in step one, along with assumptions about state policy choices and economic

convergence between Germany and the new CEE member states, to compute projected net migration rates from the latter to the former. Although much more information about this part of the process is presented in the statistical modeling chapter, it is critical to emphasize a few points about this stage here. First, every scholar working on the question of the magnitude and politics of future CEE labor migration is aware of the fact that their estimates of this behavior are problematic because of the double out-of-sample problem described more fully in the literature review discussion of previous studies of this phenomenon. Not only are these projections extrapolations of past observations into the future, they are based on data from countries outside of Central and Eastern Europe due to the short history of regularized movement between these places and EU member states. There are also considerable data problems (e.g., short time series, poor record-keeping) that plague these studies more generally. However, having some well-considered, reasonable estimates of labor migration is more useful than having none at all, even if they must be utilized with some caution. Secondly, the calculations in this step require the selection of estimators that permit high-quality projections of labor migration to be computed. As noted in the literature review, the proper choice of such estimators has been a matter of some controversy<sup>22</sup> in these investigations (Brücker and Siliverstovs; Alvarez-Plata et. al., 35-38), so a few different kinds of estimators could be employed to investigate the effects that selection might have on this study's results. One such estimator that is considered here is the country-specific fixed-effects estimator that Boeri and Brücker (2000, 120-121) adopt. This type of estimator is used to take into account factors that either remain constant or change very slowly over the course of the study (e.g., the relative level of development, historical ties, and distance between countries),

and can outperform many conventional estimators (Brücker and Siliverstovs, 735). Finally, the forecast models developed in the statistical modeling chapter allow this investigation to explore the possible effects of diverse future economic and political assumptions using policy choices and economic data related to the new CEE member states either collectively or individually. For instance, one can project CEE migration rates under several kinds of economic convergence conditions (high degree of GDP convergence versus low) or policy decisions (immediate versus delayed implementation of free labor mobility). A few different such scenarios are forecast for CEE migration to Germany in that chapter, a step which could both help set reasonable bounds for that migration and determine whether certain policy choices might be expected to work effectively or not.

The third and final part of this study's statistical modeling involves taking the estimated net migration rate information calculated for each year of the forecasts and multiplying it by the population of the relevant CEE country. The collective results of these calculations represent the number of CEE workers and their dependents who move away from home for each year of the forecasts, which can then be aggregated to produce five, ten, twenty, or more-year projections of CEE migration. However, these figures only correspond to movement to Germany, the dominant migrant-receiving country in the EU15 prior to CEEC8 accession. In order to forecast migration levels for the entire EU15, one must know what percentage of CEE labor migrants who worked in the EU15 member states as of a time close to CEEC8 accession chose Germany as their destination country. Fortunately, that information is available (Boeri and Brücker 2000, 126-128) and is used here to complete these projections. Of course, this strategy assumes that the

pattern of migration that existed before and after enlargement remains stable, a supposition that seems reasonable in light of the findings of network<sup>23</sup> migration theory.

*Case Study Method*--The second research tool employed to investigate CEE labor migration to the EU15 countries here is the case study method. Case studies can complement and supplement statistical and computational research methods by using natural language approaches to investigating the questions under study. These procedures can permit researchers the ability to examine events, concepts and policies that are difficult to quantify, exist in small amounts, or require thick description for the topic to be explored adequately (George and Bennett). These advantages of the case study method are exploited here through a brief examination of the UK as a migrant-receiver country in the EU15 member states and Poland as a CEEC10 migrant-sender country. In particular, this analysis searches for initial evidence of welfare or unemployment benefit exploitation among the workers of two countries that have constructed an important migration relationship over the past several years. The operative notion behind this examination is that if “social tourism” (van der Mei) does not seem to be taking place between these two countries that have such a deep-seated migration flow connection, then it is probably not taking place on a large scale elsewhere in the EU either, despite desperate warnings to the contrary prior to CEEC10 accession. Note that the case study method is perfect for addressing this matter given the small number of countries and short time period involved in this research. Obviously, one must be extremely cautious in generalizing the results of a single case study to a broader set of interstate relationships, but data availability and time series issues necessitate this small-scale approach. Additionally, conceptualizing social tourism into a variable that can be simply fit into a

statistical equation is an astoundingly difficult proposition; using natural language models, along with some numerical data, is almost certainly the best tactic for investigating this question.

*Systems Modeling*--The final research instrument that is utilized in this study is a type of algorithmic modeling called systems modeling (Richmond; Sterman). Much more information about the theory and operation of systems analysis and systems modeling is provided in the systems modeling chapter, but it is worth noting at this time that the stock and flow architecture of systems modeling seems to dovetail well with the commonly used stock and flow language seen in migration studies (e.g., Salt et. al., 18-33, 45; Papademetriou, xvii-xx). Perhaps the best way to describe how the creation of systems models proceeds is to divide the process into three stages as is also done in the statistical modeling portion of this discussion. In the first stage, after the underlying framework of the systems model has been constructed using known relationships from prior studies of labor migration, the model is programmed employing past CEEC10-related data. The basic purpose of this step is to replicate previous CEEC10 migration to Germany, so the choice of estimators is less vital than being able to recreate earlier system behavior (as long as the estimator, data and relationship choices are defensible, of course). Essentially, researchers can be somewhat more confident in their models' predictions for the future if they can reproduce the past behavior of their systems.

Just like with this study's statistical modeling, a goal of the second step of its systems modeling is to forecast how many CEEC10 workers could be expected to take jobs in the German economy over their first few post-accession decades. Many of the variables and estimators that are utilized in this step, and in the first one as well, are

featured in and derived from the statistical models<sup>24</sup> constructed in the relevant chapter. However, relationships and variables that are excluded from the statistical models for various reasons are parameterized in this stage of the process as well. Details concerning these factors, as well as the data and estimators utilized in the systems models, can be located in the appropriate chapter, but it can be safely argued here that these models should be able to create interesting conclusions about various features of CEEC10 labor migration. Clearly, the primary purpose of the second phase of the systems model construction and usage process is to estimate the future movement of CEEC10 workers to Germany over the first few decades after CEEC10 accession. However, since the basic systems model tracks the movement of people from one place to another directly and does not use net migration rate as a proxy, it is a relatively easy matter here to combine the statistical model development's third step with its second one and convert the figures for migrants to Germany to migrants to the EU15 countries overall.

Finally, in the third stage of the systems model development process, some speculative experimentation involving the economic and policy parameters of this model can take place. Some parts of this process are similar to what is done with the statistical model (e.g., altering the economic convergence factor level, choosing different population change factors), but others are only possible due to the nature of systems modeling. For instance, this step must also feature some sensitivity analyses and stress tests to insure that the projections derived from these models are not dominated by one or a few particular variables. These tests should inspire confidence in the systems models' forecasts and make it more valid to compare their results with those drawn from the purely statistical models.

The only subject remaining in this section of the discussion is to determine the value that is added to this research by its inclusion of systems modeling. Although the systems modeling chapter explores this matter in more detail, a few points directly tied to the immediately preceding deliberations should be outlined here. First, systems modeling can be more intuitive than statistical modeling in that the former follows objects flowing between two areas of interest (CEE10 workers from home to Germany and back, in this case). The latter, however, utilizes net migration rate<sup>25</sup> as its dependent variable; that figure must then be converted to numbers of workers using the relevant population figures. In studying labor migration, this process is a bit longer and less instinctive than monitoring the movement of people directly. Another way in which systems modeling can supplement statistical modeling is that the systems models created by this research can explicitly add consideration of demographic variables to the procedure (i.e., age structure and population information can be included here). This inclusion, and the feedback mechanisms that may accompany it, should prevent the sorts of problems that Kupiszewski (2002, 631-633) criticizes in previous CEE migration models. Finally, in addition to the relevant demographic characteristics, the systems model developed in this research allows one to consider the economic, educational and other attributes of the migrants under study. In the statistical models, the workers who move are undifferentiated from one another in the net migration rate figure. However, it could be interesting from a theoretical and policy point of view to consider what sorts of actions a government could take to encourage the “right” kinds of migrants to come to their economies. Those sorts of matters could not be addressed easily using only statistical

models; in short, systems modeling and statistical modeling can be quite complementary to one another if both are performed correctly.

*Outline of Subsequent Chapters*--The second chapter of this dissertation starts with a comprehensive overview of the literature relevant to the topic of labor migration, including the broader theories of why people move, how other scholars have conceptualized this notion, and how this piece conceptualizes it. This material affords a good general setting for a concise but inclusive history of European labor migration over the past few centuries and description of EU labor migration policymaking over the last fifty years. Most importantly, this literature review contextualizes the different methods of forecasting labor migration and many specific past instances of when the CEE-EU15 migration system has been the subject of academic study.

Chapters Three and Four comprise the original research portion of this dissertation, beginning with the statistical modeling section. After some introductory comments, the relationships that underlie, and the hypotheses that are tested by, the statistical models are explicated and defended using brief references to the relevant literature. The data and methods section follows this description, along with details about and justifications for the statistical models' construction. The results of the statistical models employed to calculate the forecast estimators of net migration rate are then presented and discussed, after which the relevant projections of that rate to Germany and the EU15 countries are imparted and elucidated. Should the operative theoretical expectations of this research be correct, one would anticipate the discovery that relatively few CEEC10 workers would be expected to arrive in the post-accession EU15 economies. At the end of this section, a brief case study about the potential for benefit

tourism in the Poland-UK free labor migration relationship is included to illuminate some of the features of the statistical models' results. This case study places the migration rates projected by the statistical models into a context that should increase understanding of the dynamics of this process and permit investigation of questions that are less well-suited for statistical methods.

The fourth chapter of this research effort focuses on the construction, explication and results of various systems models of CEEC10-EU15 labor migration. These models are based on policy variable and assumption adjustments of one principal systems model that is described and defended thoroughly in this chapter. This section of the discussion opens with an exposition of the theory and utility of systems modeling as an analytical technique. Then, the relationships that comprise this systems model are described in detail; since large portions of the theory behind that model are the same as the statistical model defended in the preceding chapter, more attention is given here to the relationships, operationalizations and data that are unique to the systems model. The underlying causal loop diagram<sup>26</sup> that elucidates important behaviors of the EU labor migration system is included and described in some detail in this section. Once the basic systems model has been constructed and supported, that model is used to reproduce the CEEC10-German labor migration systems behavior for as much of the period between the end of the Cold War and CEEC8 accession as possible. This step is necessary to ensure that this systems model is at least a reasonable facsimile of how this system behaved during the relevant period. The creation of several CEEC10 labor migration projections, including forecasts affected by policy and demographic shifts that are of interest to this research, follows this step. Sensitivity and surprise behavior tests are

utilized here as well, simply to ensure that the model holds up under a number of potentially adverse conditions and that no one variable has too much influence over the model's results. The outcomes derived from these models are also discussed here; once again, these systems models should supplement the insights gained from the statistical models described in the prior chapter. Hopefully, these results are in accord with the expectation that a relatively small number of CEEC10 workers would be expected to shift economies after their countries' EU accession.

The final chapter of this dissertation thoroughly explores the theoretical, political and policy implications of the previous chapters' work. First, a brief appraisal is conducted of whether the hypotheses that guided the construction of the original models are supported, and it is ascertained whether this study can contribute to the current general migration literature debate on the overall determinants of migration. These results are also utilized to illuminate the narrower literature dispute about expectations of EU worker movement from the CEEC10 to the EU15 member states. That explication should permit this section to include comments on whether a motivational belief of this research, that EU politicians have been too concerned in the past with mass worker migration from poorer to richer EU regions, can be sustained. The results of this research are also used here to discuss the migration policy implications related to these findings. In other words, the effectiveness of what politicians attempt in order to influence the number and types of workers who come to their economies to find employment is reviewed. More specifically, this portion of the last chapter analyzes whether delaying free mobility for new member-state workers or enacting some other policy choice might be a more effective way of protecting vulnerable EU15 workers from post-accession dislocation. Finally, a few

remarks concerning how labor migration and mobility fit into the discipline of political science and the future of this research agenda are made to conclude this chapter.

**Broader Implications of this Research and Chapter Conclusion:**

There are several theoretical and practical reasons why the consequences of this research could enhance the discipline of political science and its collective understanding of politics and public policy more generally. First, the outcomes of this study could provide evidence in favor of one or more theoretical perspectives on why workers leave their home countries for foreign economies to find employment there. Although constructing a unified theory of migration is beyond the remit of this project, any information that supports or discounts any of the various competing migration theories pushes the discipline forward in this area. This statement holds equally true for the differing forecasts of CEEC10 labor mobility that are described in the literature review. If this research can improve on these predictive models and clarify some of the disputes between them, then something important has been made available for further studies of CEE labor migration and other analyses related to this issue.

The matter of learning by public policy practitioners and academics is another place where this study might make some useful contributions to a greater understanding of the issues involved with this subject. Even though all of the CEEC10 economies are finally part of the EU, the question of how many and what kinds of future workers the EU15 member states could expect from these countries is not a settled one. Partially, this statement is true because labor mobility restrictions on these workers are still in force in many EU15 countries. The question of whether EU15 politicians should have enacted and continue to enforce these derogations given the state of knowledge about CEEC10

worker mobility at the relevant times is still an interesting one to consider. It is also necessary to investigate how other kinds of public policies (cohesion, social welfare, employment) may influence workers' interstate migration decisions as well. The short case study that is part of this research should, at least to a limited extent, allow tentative conclusions to be reached on parts of this question. However, the primary reason why the issue of labor migration expectations from new member states is still a vital one is that the EU continues to plan further expansion into Eastern and Southern Europe (including perhaps Turkey someday). A common argument that one would expect to hear in opposition to future EU expansion is the idea that admitting ever-poorer states into the EU will encourage a horde of their workers to invade the labor markets of the wealthier EU countries. This action would be done at a time, so this claim would continue, when the EU is still processing the implications of the CEEC10 accessions. Any evidence concerning the likelihood of mass labor movement might be treated seriously by all sides of this controversy. In any event, interstate worker migration is likely to continue for the foreseeable future to be an important political issue in the EU and the developed world more generally.

Furthermore, incorporating systems modeling more firmly into the methodological practices of political science would represent an increase in the variety of tools utilized in the discipline for investigating important research questions. The introduction to the systems modeling chapter states extensively that political science has not exploited the features of this technique very much in recent years. Although this tool is not appropriate for every research question, there are some, like migration, for which systems modeling can be quite valuable if used in tandem with other techniques.

However, the methodological opportunity created by the present contribution is not simply a matter of emphasizing a neglected instrument in the political science toolbox. Using systems modeling and systems thinking in an attempt to better understand the dynamics of EU worker migration can engender a deeper appreciation of how these systems work in reality and could lead to more sophisticated quantitative and qualitative models and forecasts of this phenomenon. Systems modeling is also quite appropriate for studying labor migration given its structural compatibility with how workers move between countries. Finally, this investigation's systems models should allow it to make a few interesting statements about the characteristics of CEEC10 labor migrants beyond their mere numbers, unlike what is generally possible with statistical models.

In addition to the other enhancements to the literature that this research wishes to create, there is one more task that it wants to accomplish through its successful conclusion. This goal is to bring the issues of labor mobility and migration closer to the center of political science research because of their noteworthy political and policy implications. As the background information provided by the first few paragraphs of this chapter indicates, the EU has struggled with the question of worker mobility since its inception. However, for the most part, the academic literature on labor mobility resides in the fields of economics, population science and history (Messina and Lahav). This state of affairs is unfortunate, because the mass movement of workers across state borders (or at least the perception of their large-scale movement) can have acute and pressing impacts<sup>27</sup> on the receiving and sending countries' political systems (Zimmermann 2005, 6-12). Political scientists should pay much more attention to these issues than they do because of how labor mobility issues can impact the politics of the systems they study,

and any research that indicates how this phenomenon can be guided by public policy is useful in accomplishing that goal. Hopefully, this research can help to establish migration and labor mobility issues as more mainstream topics within the discipline.

It is worthwhile in concluding this discussion to spend a few moments assessing what has been accomplished here before transitioning into the literature review portion of this project. Some basic facts about the purposes of the European Union and how those principles affected the accession processes of ten Central and Eastern European countries in the 2000s begins this chapter. Included in this material is how CEE labor migration might have been expected to compare with what was observed after a similar EU enlargement in the 1980s and how previous studies of potential CEE migration had estimated the magnitude of this phenomenon. This background information creates the setting in which the research questions for this contribution are briefly explicated. Issues concerning the expectations of EU15 politicians, policymakers and publics about substantial CEEC10 labor movement after those countries' EU accession are then described. An outline of the methods utilized by this study, which is supplemented by the appendix that immediately follows this paragraph, is offered as a preview for the information provided in the empirical research sections. The wider repercussions of this contribution and a summary of how this dissertation proceeds ends the body of this chapter. In conclusion, the literature review that comprises the next section advances this investigation by providing the theoretical and historical settings for the propositions that are closely examined in the empirical research chapters.

## **Appendix--Modeling in Political Science:**

Although different kinds of modeling (Lave and March) have been major research tools of social scientists for many decades, especially in political science since its post-World War II turn to behavioralism, there exists in the literature considerable terminology profusion and confusion<sup>28</sup> concerning this topic. Therefore, an important task is to follow in the footsteps of Alker (1975, 144-145), who attempted a similar project for statistical modeling, and endeavor to formulate a general picture of how the different kinds of social science modeling are related to one another. This portrait is necessarily cursory, but hopefully complete, and emulates earlier efforts by Taber and Timpone (1996) and Saunders-Newton (2006). In order<sup>29</sup> of increasing abstraction from and decreasing verisimilitude to the real world, the three broad modeling categories utilized here are naturalistic or natural language, computational or algorithmic, and analytical or mathematical modeling (Saunders-Newton, 175; Taber and Timpone, 43).

*Naturalistic Modeling*--These representations of reality are those that are expressed in ordinary or academic language using the prose format. An evident advantage of this tool is that it is available to any literate person; as long as one can read at the appropriate level, the conclusions of these models are theoretically accessible to anyone. Very little specialized training is necessary to understand the format in which these models are expressed. However, as Fiorina (1975, 136-139) indicates, natural language models have considerable difficulties, including conceptual imprecision, ambiguities in the meanings of important terms, and the problem of camouflaging model assumptions. On the other hand, the in-depth, thick-description case studies that may be extremely useful in illustrating a particular theory's implications are unavailable without using natural

language tools (Bates et. al. 2000, 696). These models include verbal theories, thought experiments, ethnographic studies, hermeneutics, analytic narratives and counterfactual experiments (Taber and Timpone, 43; Saunders-Newton, 175). Analytic narratives (Bates et. al. 2000, 696) are an attempt to improve and utilize theory in case studies, the in-depth exploration of a particular political, social, historical or economic event. Case studies (George and Bennett) are notorious for being atheoretical or impossible to generalize beyond the bounds of that particular instance, but analytic narratives<sup>30</sup> are an effort to address these criticisms while still reaping the benefits of examining some case in considerable detail. Counterfactual experiments (Fearon; Taber and Timpone, 44) are designed to explore the proverbial “dog that didn’t bark”. In other words, they allow researchers to opine about what would have happened if some chain of events that did take place had not or what would have occurred if something that did not take place actually had. There are obviously major problems with “playing the what-if game” in the social sciences, just as there are with extrapolating past trends into the unknowable future, since there are few ways that one could confirm one’s assertions here. However, counterfactuals can be quite useful in clarifying a researcher’s thought processes and the implications of the hypotheses that she is considering.

*Analytical Modeling*--At the other end of the verisimilitude-abstraction scale from natural language models are analytical or mathematical models. Many of the most respected, popular and versatile techniques in the social scientist’s methodological toolbox fall into this category, including statistical and time-series models, dynamic<sup>31</sup> modeling, decision and game theory, and logic (Taber and Timpone, 43; Saunders-Newton, 175). Two of the more common types of dynamic modeling are difference (Huckfeldt et. al.) and

differential<sup>32</sup> equation modeling. Although difference and differential equation modeling are not statistical, they are complementary to statistical modeling and can be used in tandem with statistical modeling to understand the dynamics of synchronic change (Huckfeldt et. al., 9-10). That strategy of utilizing both dynamic and statistical modeling has been implemented sometimes in the international relations literature, in fact (e.g., Gillespie and Zinnes). Since it would be impossible here to do justice to the wide variety of statistical and time series models that have been utilized in political science over the decades, it must be sufficient to the purposes being served in this discussion to note that these techniques have been employed in some pieces on migration (e.g., Hatton; Karras and Chiswick). Decision and game theory (Axelrod 1984) have also been used to study a wide variety of topics in political science and international relations.

Analytical models have several distinct advantages to recommend them, including clearly stated assumptions, improved conceptual precision, and an increased ability to communicate results between social scientists who use the same techniques but not necessarily the same natural languages (Taber and Timpone, 43). These benefits should allow researchers to build upon one another's work and create the cumulative knowledge that is so important to the social sciences. However, there are substantial disadvantages to them that imply that they may not be appropriate for all research questions or for all investigators. One of the most important such problems is that analytical modeling requires a considerable up-front investment in learning how to understand, manipulate and apply these techniques. Statistics, game theory, formal modeling and dynamic modeling all involve studying specific techniques for considerable amounts of time in order to master them, and to the uninitiated these tools are impenetrable enigmas. The

greater criticism, however, originates from those academics who argue that these techniques abstract so far from the real world that their results are meaningless or are of miniscule importance (Elster; Green and Shapiro). In the end, what these methodological disputes seem to suggest is that the best research makes use of a combination of techniques that compensates for each tool's weaknesses (George and Bennett, 37-57), a strategy that the current research pursues.

*Computational Modeling*--Of great interest here is the category of models that occupies the middle ground between high verisimilitude and high abstraction, computational or algorithmic models. Although the deployment of this kind of modeling in the discipline dates back to at least the 1950s, and while it is true that it can be a very flexible and useful tool for investigating many political questions, computational modeling has not attracted as much research attention as its promoters feel that it should (Taber and Timpone, 41-42). This class of models includes neural and social network modeling, computer simulation, dynamic modeling (including systems modeling), and agent-based modeling (Taber and Timpone, 43, 46; Saunders-Newton, 175). Dynamic modeling has afforded scholars a productive vein of results and insights into political behavior, especially for certain international relations subjects. For instance, arms races have been examined extensively by numerous researchers over the past several decades (Brito and Intriligator; Gillespie et. al.; Taber and Timpone; Sanjian), particularly through the use of the Richardson (1960) arms race model<sup>33</sup> that depicts weapons spending by two rivals using fairly simple differential equations (Taber and Timpone, 42). The wider peace and conflict studies literature has been enriched through applications of dynamic modeling (Mesjasz; Maxwell and Reuveny) as well, most notably in the fields of ethnic conflict

and genocide (Lustick et. al.; Bhavnani and Backer; Harff and Gurr; Schrodt and Gerner). Dynamic models have also been utilized to investigate and forecast (Choucri and Robinson; Harvey) global population, trade, environment and economic trends (Clark and Cole; Meadows et. al. 1972; World Bank 2006; Forrester 1973; Onishi; Widmaier; Pollins). International relations is not the only political science subfield that has exploited dynamic modeling techniques profitably, however. American politics scholars, especially those who study psephology (elections and voter behavior), have been able to gain considerable purchase on this subject through dynamic modeling (Gurian; Brunk; Carsey and Layman; Knoke and Macke; C. Brown; Mondak). Fields of study outside of political science, such as demography (Lee and Tuljapurkar; Rosero-Bixby and Casterline), have been able to take advantage of dynamic modeling as a research tool as well. Additionally, this specific algorithmic model has not been the only one that has been employed by political science researchers; for instance, Axelrod (1976) and Taber (1992) have illustrated the utility of cognitive mapping and expert system models in the discipline, respectively, and Stokman and Berveling (1998) have demonstrated that network modeling can be helpful in understanding policymaking processes. Finally, agent-based modeling, which is attempting to study how individuals act within a particular setting using computerized algorithms of people and their preferences (Bhavnani, 126-127; Bruun), has found some limited use in the social sciences (Axelrod 2006, 140).

The benefits of computational over natural language models are much the same as those of using analytical over natural language models (e.g., assumption clarity, conceptual and communication precision), but one might also contend that there are considerable advantages to using computational over analytical models as well (Taber

and Timpone, 43-46). First, computational (including systems) models can permit theoretical uncertainty to deliberately enter their construction where necessary. Since researchers rarely have perfect theoretical knowledge of the relationships between, and the values of, the variables under investigation, it can be valid for them to explicitly build that uncertainty into their models. Mathematical models have less flexibility to permit that strategy and generally must be radically simplified in their structure in order to be tractable, while computational models are less likely to suffer from those issues. In addition, computational models can be considered more versatile than analytical ones because some concepts that might be very difficult to express mathematically (such as an agent's decision-making process or an arms race) may be written relatively simply as algorithms. Computational modeling also allows disparate theories and empirical results to be integrated into a single model relatively straightforwardly, which could be very helpful for the creation of a new theory or the testing of older, established ones. That testing could even include the creation of counterfactual cases to gain a deeper understanding of the phenomenon in question. Finally, and most importantly, this set of techniques permits researchers to investigate the complex political and behavioral processes behind what they observe. Since it is designed to allow this kind of inquiry, tracing the multifarious progressions by which political, economic and social events occur is easier with a tool like computational modeling than analytical modeling, which is less adept at this task.

However, computational modeling is not the perfect tool for all research questions and it has its own issues with which to contend (Taber and Timpone, 45-46). As is also true for analytical models, learning how to comprehend and generate results from

computational models requires considerable specialized training that may not be generally available to all researchers. It is clearly not impossible to become skilled at these techniques, but mastery of them does require a non-trivial outlay of time and effort. The quality of the results of computational models is also highly dependent on the assumptions that the researcher makes at the initiation of the process. If those assumptions are flawed or theoretically questionable, the outcomes of that work are also damaged or at least open to genuine question. However, perhaps the most serious problem that computational (including systems) models has is that their users have a difficult time testing the validity of their models and results. As the systems modeling background section discusses in some detail, there are few broadly accepted tests for verifying computational models. This lack of the equivalent of F-tests, t-tests and similar tools that statistical models possess opens up computational models to charges that they are little more than individual researchers' flights of fancy. In the end, perhaps the only way to address these criticisms adequately is to use a combination of methodologies that compensates for the weaknesses of some techniques with strengths from others.

*Criticisms of All Modeling Techniques*--Although this discussion has been reporting critiques of each of the three types of modeling techniques as it has progressed, it is also worthwhile to describe some broader criticisms of the modeling enterprise in political science more generally. For instance, Rodgers and his co-authors (1976, 395) remind social scientists that "a model is only a shadow of reality," and that the real test of its utility resides in whether it helps scholars understand the real world better. Their conclusion is that many of the models (especially the global computational ones) that were in use at that time had serious structural or data problems, were deterministic or

untested, or gave spurious or marginal results, implying that model-builders should tone down their claims for what their models could demonstrate. Doran (1999) asserts that all models of future behavior (forecasts) are bound to fail because they almost always utilize linear assumptions for forthcoming events and lack a technique for predicting when the trend patterns under study will shift to a non-linear structure. Discontinuities in international relations (e.g., wars, financial crises) are inherently unpredictable, and there is no way that the inflection point between business as usual and the spiral to disaster can be foreseen. That basic fact does not imply that social scientists and policymakers should not try to understand the dynamics of normal and extraordinary times, make reasonable predictions about and plans for the future, or learn from past mistakes. However, it does mean that all such forecasts should be treated with extreme caution and that policymakers should always be ready for these predictions to be proven wrong by real-world events (Doran, 32-33, 36-37). Finally, Granato and Scioli (2004, 313-314) begin their piece by describing some frequent criticisms of three of the most common methodological tools from two of the three categories described above: formal models (they often dismiss or ignore important information about the topic under study); statistical models (they can lack solid theoretical foundation); and case studies (they tend to be overly focused on idiosyncratic details). What these authors then assert is that only by combining formal models with empirical tests, either statistical or case-study, can the accumulation of knowledge in the social sciences be achieved. In other words, only a careful combination of the advantages of different methodological techniques advances the discipline, a point with which this research concurs.

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<sup>1</sup> It was much easier, however, for the Treaty of Rome signatories to establish this objective than it was for them to accomplish it; a full generation passed before virtually all of the final barriers on the movement of these factors of production were abolished with the implementation of the Maastricht Treaty (Treaty on European Union) in 1993 (Dinan 2003, 26; Wood and Yeşilada, 57-60, 72-73). As it currently stands, Article 48 of the Treaty of Rome guarantees the free movement of workers, while Articles 52 through 58 safeguard the right of establishment of self-employed workers (i.e., self-employed individuals can start businesses and otherwise work without handicap in all member states) and Article 59 secures the free movement of services (Salt et. al., 2-3).

<sup>2</sup> Academic arguments in favor of free mobility of workers can be divided into two basic categories, philosophical (Carens; Ugur, 66-76; Lane, 134-141) and economic (Pritchett; Kapur and McHale; Hamilton and Whalley; Ugur, 76-83). For instance, restrictions on migration are illegitimate from a utilitarian perspective because although some workers may profit by having their jobs protected from an influx of outside competitors, the increased utility of the potential migrants and of the receiving-country social actors who benefit from migration generally outweigh those benefits to the protected workers (Carens, 263-264; Ugur, 66-67). From a Rawlsian (1971) point of view, limitations on migration are equally suspect because no one behind the veil of ignorance would choose to put themselves in a position where they would be unable to take advantage of the potential benefits of moving to another country for work (Carens, 255-262). Finally, libertarians' invocation of private property rights to exclude migrants from enjoying the public goods benefits of living in wealthier countries fails because of the inherent tensions and conflicts that exist between the notions of private individual property rights and the ownership of public goods (Ugur, 68-69; Carens, 252-254). The economic argument in favor of free migration is fundamentally one of improving global economic efficiency and individual welfare (Hamilton and Whalley, 61-67; Ugur, 76-77). Essentially, labor flows from parts of the world that have too much of it to other parts that need it, reducing the costs of labor and thus increasing efficiency. At the same time, the workers themselves improve their lot by moving from places where they can gain relatively little from their labor investments to places where they can gain much more (thereby also improving overall efficiency). In fact, removing the impediments to the free mobility of workers would allegedly increase global efficiency by many times more than dismantling all of the remaining analogous barriers to trade (Hamilton and Whalley, 70-73; Pritchett, 33-34). Although there are inherent problems with the comparison between barriers to trade and those to worker mobility (Pritchett, 33-34), just suggesting this contrast demonstrates how rarely these issues are explicitly linked in policy debates over these issues.

<sup>3</sup> The incorporation of the Schengen Agreement (Uçarer 2007, 306-307; Rifkin, 198-199; Reid, 207-208) into EU law via the 1997 Treaty of Amsterdam was designed to remove the last major hindrance to free worker mobility, the presence of constant customs and passport checks at intra-EU frontiers. However, Schengen's implementation has been incomplete and slow, most notably in the opt-out countries (UK and Ireland) and the new Central and Eastern European (CEE) member states. For instance, only five of the original six European Economic Community (EEC) countries signed onto Schengen when it was first drafted outside of the European Community's (EC) auspices in 1985 (Italy did not participate until 1990), and it took several years for most of the 2004 CEE entrants to put its provisions into effect (Staples, 111, 114, 156, 165-174; McCormick, 160; Lungescu 2007).

<sup>4</sup> Eight Central and Eastern European countries (CEEC8) joined the EU in May of 2004: Poland, Hungary, Czech Republic, Slovakia, Slovenia, Estonia, Latvia and Lithuania (Dinan 2005, 143-152). Two more states, Bulgaria and Romania, completed the enlargement process in January 2007 (Drew and Sriskandarajah). The CEEC10 member states are therefore the eight that joined the EU in 2004 plus Romania and Bulgaria; however, the AC10, another common abbreviation, refer to the ten EU member states (the CEEC8 plus Cyprus and Malta) that finished the accession process in 2004 (Dustmann et. al., 4). Several candidate countries (like Turkey, Croatia, Macedonia, and the western Balkans) are in various stages of this process but have not yet been given firm EU membership dates (Barnes and Barnes, 433-436). This research focuses on labor mobility from the CEEC10 member states, although it may someday address it from these candidate countries also.

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<sup>5</sup> A common shorthand for discussing matters related to the EU member states, especially statistical averages, is to use the number of countries in the organization at that time preceded by the appropriate acronym. Therefore, EU25 refers to the 2004 to 2006 array of member states, and EC9 describes the countries that were in the European Community between 1973 and 1981. In order of accession, the EU15 members from 1995 to 2004 were as follows: Germany, France, Italy, Belgium, Netherlands, Luxembourg, Denmark, Ireland, UK, Greece, Portugal, Spain, Austria, Finland, and Sweden (Wood and Yeşilada, 4). In January 2007, it became appropriate to use the acronym EU27 to describe the EU's entire membership. Additionally, name changes for what is now known as the European Union have been relatively common in its short history. It is generally accepted that the EU had its start as the European Economic Community in 1958, became the European Community in 1965, and only became the European Union in 1993 with Germany's ratification of the Maastricht Treaty (Dinan 2005, 7, Table 2.1, 40, Table 4.1, 99). This work is careful to employ the historically appropriate name at all times, but most commonly utilizes the terms European Union or EU when discussing the organization. A more loosely bound economic organization, the European Free Trade Association (EFTA) currently consists of only four members: Iceland, Liechtenstein, Norway and Switzerland. The first three of those countries have adopted many of the EU's rules through their membership in the European Economic Area (EEA), an organization that promotes closer economic and political cooperation between its members that falls short of full EU membership (Dinan 2005, 137-141).

<sup>6</sup> Furthermore, the economic and political situation facing the wealthy EU countries in 2004 was much more dire than that of the mid-1980s. First, Germany had not fully dealt with the economic ramifications of reunification; it was still heavily subsidizing its eastern *Länder* and had only limited funds to spare for other formerly Communist areas. France and Germany, the countries that had been the engines and underwriters of EU policy previously, were underperforming economically. Finally, Great Britain had decided to remain aloof from the most important EU projects of the preceding decades, especially monetary union (Poole, 33-36; Dinan 2005, 143-152).

<sup>7</sup> In retaliation for so many EU15 countries taking advantage of the free movement derogation, and in compensation for the disruption that creating the new Schengen external frontier caused, Hungary, Poland and Slovenia adopted reciprocal restrictions on the labor migration ability of EU15 citizens whose governments had invoked the derogation (Maas, 81; Bijak et. al., 130). Additionally, because its labor market is so tiny, Malta was induced to take partial advantage of its transitional arrangements safeguard clause that limited the number of other EU workers who could be legally employed in that country (European Commission 2006, 4; van den Bogaert, 61). It should also be noted that all ten 2004 accession countries fully opened their labor markets to each other upon their accession and that Maltese and Cypriot workers are not subject to the EU15 countries' worker mobility derogation (European Commission 2006, 4; Kunz and Leinonen, 148).

<sup>8</sup> The United Kingdom, Ireland and Sweden declined to adopt this derogation for the 2004 CEE new member states, while only Sweden and Finland refused to implement it for Bulgaria and Romania (Drew and Sriskandarajah).

<sup>9</sup> These economically struggling areas include southern Italy, an area that has been part of the EU since its inception, and many of the industrial areas of the UK, a relatively wealthy country that has been an EU member since 1973. The program also has a reputation for squandering funds on projects of dubious value, even according to a World Bank report on this matter (Dinan 2005, 382-384).

<sup>10</sup> Zolberg (1983, 239), for example, maintains that migration is an "exceptional phenomenon" given the many cultural, economic and policy barriers that exist against it. Fassmann and Hintermann (1998, 60) go so far as to call the fears of mass CEE labor movement to the EU15 countries "irrational and superficial."

<sup>11</sup> In fact, regional migration apparently decreased during the early part of the 1990s (a time when many EU leaders hoped that worker movement would greatly increase due to their implementation of the Single European Act and the Maastricht Treaty) due to various economic problems (Lindley, 212).

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<sup>12</sup> In response, the EU has created a number of schemes (such as LINGUA and EURES) that encourage EU workers to take jobs in fellow member-state countries. Programs to persuade EU students to study in other countries have proven to be somewhat more successful than those to promote worker mobility; for instance, the Erasmus/Socrates program has enabled more than a million European students to study outside their home countries (Maas, 112; Recchi, 71; Schumacher, 16-18).

<sup>13</sup> As an aside, it seems ironic that so many EU15 member states have expended so much effort to cut off an expected deluge of CEE workers at the same time that the European Commission is desperately trying to encourage this behavior throughout the entire organization (European Union, 2006).

<sup>14</sup> Although the models developed by this research are, like most of the others in the migration literature, inspired by micro-level neo-classical economic explanations of why individuals move from one place to another to seek work, they are not individual-level models of why that happens. That sort of data would be almost impossible to collect in large amounts, so this study must depend on aggregate-level GDP and per-capita income differentials between sender and receiver countries to act as proxies for the individual-level income differences utilized by this theory. That practice is normal in the literature (e.g., Boeri and Brücker 2000, 153; Fertig, 712; Zaiceva, 13) and should cause no problems here.

<sup>15</sup> An important concept that appears throughout the labor migration literature is that of push and pull factors (Deutsche Bank Research, 16-17; Hailbronner, 16-17; Martin and Taylor, 98-102; Bauer and Zimmermann, 19-21; Öberg, 23-25). Push factors are those that affect the supply of labor; in other words, conditions that induce migrants to pursue work outside their home countries. These items include high unemployment, low domestic wages, serious poverty, and intrastate conflict. Pull factors are the ones that attract migrants to specific host countries, including: high wages or a sufficiently large wage differential between the sender and receiver economies; a booming economy and the plentiful job opportunities that come with it; easily available housing; and a strong demand for labor due to a declining birth rate, economic reconstruction or a shift in how certain jobs are perceived by local workers. Although Zulauf (2001, 21) implies that push-pull factors are limited to behavioral approaches to migration when she describes push-pull models in sociological studies of migration, they appear in historical-structural models as well (Piore, 133-140). This point is revisited briefly in a later explication on the wider literature concerning why people engage in labor migration.

<sup>16</sup> Indeed, it seems although the identity of the sources of these labor migrants changes over time (southern Italy, Ireland, Greece, Spain, Portugal, the Central European countries), the overstated public worries about them has invariably been the same (Massey et. al. 1998, 125; Tassinopoulos, et. al., 23). Apparently, there does not seem to be much learning taking place on the part of member-state politicians about what they and the citizens who they represent can realistically anticipate when new countries join the organization despite the long history of EU labor migration policy.

<sup>17</sup> As a matter of fact, some early evidence on the size and effects of CEEC8 labor migration (Boeri and Brücker 2005, 14-16; BBC News 2006; Portes and French, 33; Gilpin et. al., 49) appears to bear out this assertion since there has been only a modest though measurable movement of these workers to the EU15 countries that did not take advantage of the free mobility derogation. Additionally, the member states that foreswore this exemption were more economically successful in the first years after CEEC8 accession than those that adopted it (Economist 2006).

<sup>18</sup> Another implication of this perspective is that it suggests that the initial values of some of the variables in the systems models that are designed to reproduce historical trends in migration are lower than might otherwise be assumed. (These historical patterns must be reproduced when projections are made to ensure that the model is plausible.) Note that there is an inherent check on the accuracy of this argument here in that if the past patterns of migration between the CEE and EU15 countries cannot be repeated and these values are the source of the discrepancy, they must be changed before the forecasting models are accepted. Second, and more importantly from a theoretical point of view, the feedback effects caused by migration can be explicitly taken into account by the systems models. In fact, feedback is a central tenet of systems

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thinking, the theoretical basis of systems modeling, because it permits emergent properties to appear and counterintuitive conclusions to be found within a system. Additionally, systems modeling allows researchers to investigate both net and gross migration patterns if desired. These ideas are explicated in considerable detail later, but for now it is sufficient to state that factors that have been ignored in past studies of CEE labor migration are accounted for openly in the current study.

<sup>19</sup> It should be noted that the European Commission report (2006, 14) is particularly explicit on this matter, stating that supply and demand factors for labor ultimately determine the number of people who move from member state to member state looking for work. In fact, it asserts that anti-free migration policies do not accomplish much other than delaying the onset of movement or distorting the natural migration patterns that would have been observed without the presence of these policies.

<sup>20</sup> After CEEC8 accession in 2004, the varying EU15 member-state policy responses to this event created quite different migration patterns from what was expected ahead of time. There was a large-scale shift in where the new member-state workers sought employment from Germany and Austria to the UK and Ireland in the immediate aftermath of this enlargement (Boeri and Brücker 2005, 14-16). One could explain that partly through the variations in economic conditions between these countries, but a large portion of the responsibility for this phenomenon might safely be laid upon the fact that Germany and Austria implemented the free labor migration derogation and the UK and Ireland did not.

<sup>21</sup> Details concerning the data sources for all of the independent variables, both economic and migration-related, can be located in the appropriate sections of Chapters 3 and 4. It should also be kept in mind that modeling is an iterative process (Serman, 87-89), so ideas for variables and models have arisen as this research has progressed.

<sup>22</sup> For instance, Alvarez-Plata and her co-authors (2003, 39-40) assert in their contribution that generalized methods of moments (GMM) estimators are more robust than other estimators. Boeri and Brücker (2005, 49-50), however, argue that GLS estimators are more efficient and superior to GMM estimators given the fairly small group dimension of their panel. Other authors (Boeri and Brücker 2000, 116) assert that fixed-effects estimators are best for pooled cross-sectional data sets such as the ones compiled for contemporary labor migration studies. This issue is revisited in more detail elsewhere in this project.

<sup>23</sup> As is discussed in the literature review and briefly in another endnote, these patterns did not remain static in the immediate aftermath of CEEC8 accession. However, if a driving feature of this research is investigating how many workers EU15 politicians could have reasonably assumed were coming in 2004 and afterwards, this assumption still makes sense in light of network theory. Alternative figures for this transformation could be utilized in the statistical modeling chapter and justified in light of what was known during the years prior to CEEC8 accession in the interests of academic exploration, however.

<sup>24</sup> Theoretically, at least some of the estimators that are employed in these steps could be derived from statistical models that utilize CEEC10 labor migration data from the last several years leading up to CEEC10 accession. While this strategy avoids the out-of-sample problems that afflict other forecasts of CEEC10 labor movement, it squarely runs into the small data set and short time series problems that the statistical modeling procedure described above avoids. Systems modeling is somewhat more flexible concerning issues such as this one because an enervating purpose of this technique is to allow for greater speculation concerning model parameterization. On the other hand, these hypothetical CEEC10-derived estimators would likely be too unstable or otherwise unsuitable for this study since accurate data on CEE migration and economic indicators are only available for a few years prior to 2004. For instance, comparable unemployment data are obtainable for the CEEC10 only in 1996. Therefore, this study's systems models shall exclusively employ the estimators derived from the statistical model described earlier. That act reintroduces the out-of-sample forecasting problems detailed in the literature review chapter, but they may be unavoidable if anything is to be affirmed about this study's research questions using systems modeling.

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<sup>25</sup> Although Malmberg (2006, 36) cautions that: “There is no such thing as a net migrant,” it is generally easier and more convenient to track migration differentials rather than each directional flow separately.

<sup>26</sup> Causal loop diagrams are charts that illustrate, using only variable names and labeled arrows, causal links between the primary variables in the model. They are effective at demonstrating the most important connections in the system of interest in as simplified of a form as possible (Sterman 2000, 137-157).

<sup>27</sup> The defeat of the EU’s Constitutional Treaty at the hands of French voters in a May 2005 referendum has in fact been laid at the feet of the legendary “Polish Plumbers” who allegedly threaten to take away the jobs of French workers (Sciolino; BBC News 2008).

<sup>28</sup> Some of the more memorable names that form portions of the research for this assessment of modeling are dynamic soft systems analysis (Onishi), dynamic simulation, computational modeling, and systems dynamics. Even the two works that form much of the basis for this review (Taber and Timpone; Saunders-Newton) cannot quite agree in some instances about how to classify and name certain techniques.

<sup>29</sup> Please note that for expositional purposes the order in which these modeling tools or languages is discussed is different from what is initially presented here.

<sup>30</sup> For a critique of Bates et. al.’s original work (1998) in this area and the idea of rational choice analytic narratives more generally, please consult Elster (2000).

<sup>31</sup> In surveying the modeling literature, one point of great confusion and disagreement concerns the exact position of dynamic modeling in a classification scheme such as the one suggested here. Unfortunately, “dynamic modeling” is a term that is used loosely and without much attention paid to how it has been employed elsewhere. After much consideration and reflection, it has been determined that dynamic modeling straddles the line between computational and analytical models. However, for the purposes of the present elucidation and with one exception, this review shall treat dynamic modeling as if it belongs solely in the computational category. Please be aware that Taber and Timpone (1996, 43) utilize the term “formal modeling” to cover both mathematical and computational modeling techniques rather than just game theory and related tools.

<sup>32</sup> The distinction between difference and differential equation models arises in how they treat time. In the former, time is divided into equal, discrete units, while in the latter, time is continuous (Huckfeldt et. al., 5).

<sup>33</sup> Please note that the presence of the discussion of the Richardson arms race dynamic model here illustrates the overlap that exists between the notions of computational and mathematical models (see earlier endnote).

## Chapter 2: Literature Review

Any social, political or economic phenomenon that involves about three percent of the world's total population (World Bank 2006, 26-27) is bound to attract substantial interest from politicians, policy analysts and academics. That statement is most definitely true about global labor migration and the movement of people across international borders in general. However, as shall be seen momentarily, not all investigators of labor migration examine this issue using the same theoretical perspective. In fact, there are several rival theories of why labor migration occurs and continues, each of which may explain part of the puzzle that is cross-border worker movement. These theories all have somewhat different explanations for the magnitudes and patterns of European labor migration that have been observed over the past few centuries and for the EU's policymaking responses to these phenomena. Traces of these theories can also be located in the previous forecasts of CEE labor mobility to Western Europe that round out this literature review chapter. In fact, the labor migration theories, history and models elucidated here comprise the unequivocal basis for the models that are constructed in the later chapters of this work and guide this overall research project more generally.

### **General Labor Migration Literature:**

Although the discussion in Chapter 1 generally presumes that Central and Eastern European workers are induced to move from their home countries to the wealthier parts of the EU, little has been explicitly stated thus far on why that might be true. For that perspective, one must turn to the wider literature on the motivations and incentives for labor mobility. Although there does not appear to be one unified, comprehensive and coherent theory of international labor migration<sup>1</sup> (Massey et. al. 1998, 17, 281;

Tassinopoulos et. al., 12; Hatton and Williamson, 12-13; Bauer and Zimmermann, 13-21; Pryor, 110), one can divide the various approaches on why interstate labor migration occurs into a number of partially competing and overlapping schools of thought. Some of these different theoretical perspectives<sup>2</sup> include micro and macro neo-classical economic theories of migration, the new economics of migration, dual labor market theory, network theory and cumulative causation theory.

*Labor Migration as a Concept*--However, before delving into a discussion of the theoretical explanations of migration, it would be wise to state explicitly what that term means exactly as the literature on labor migration often presumes an implied meaning of this most important concept (Salt 2001, 3-4; Kupiszewski, 629-630; Tassinopoulos et. al., 6-7). Basically, labor migration occurs when workers leave their home country to take a job in a foreign economy. However, what this study is really concerned with is the annual net labor migration from the CEE accession countries to the EU15 rather than the sheer volume of workers who leave the former for the latter in some year. CEE workers may take temporary (less than one-year) positions that might not be included in this total, and “permanent” CEE workers who decide to migrate back to their home countries count against it<sup>3</sup> (Kupiszewski, 630). There are at least two important reasons for this concern with net rather than gross<sup>4</sup> CEE labor migration, the first of which is that the systematic projections examined later in this chapter all use some form of it as their dependent variable (e.g., Fertig, 712; Boeri and Brücker 2000, 114-116; Dustmann et. al., 47). The choice to follow in these studies’ footsteps makes the results of this research more easily comparable, without any adjustments to these figures, to what the earlier studies find. Second, permanent net labor migration seems to excite considerably more political

agitation against it than does the temporary<sup>5</sup> kind. This situation likely exists because of the cultural aspects of permanent migration that go along with this phenomenon (Penninx, 32-36, 44-48; Spencer, 3-9; Carrera, 115-123). Although large-scale short-term worker movement could foment negative political responses against these workers, for the most part they are tolerated as long as the receiver-country citizens anticipate that their stay in the host economy will be brief. For example, the large numbers of West German *Gastarbeiters* who were recruited in the 1950s and 1960s were not a controversial addition to that economy at first because it was widely assumed that their presence would be temporary. However, political backlash began to build against them when it became more obvious that their stay in West Germany was going to be longer than initially anticipated (Meyers, 128-133). In short, this study is concerned with longer-term worker migration due to the greater potential impacts that it has on receiving and sender-country politics.

*Macro and Micro-Level Neo-classical Economic Theories*--The most well-known of the various approaches to migration incentives, and thus the first of them to be discussed, are the theories that use economic concepts as their basis. Macro-level neo-classical economic theories posit that interstate labor mobility is a function of the factor endowments of different countries. The Heckscher-Ohlin-Samuelson (HOS)<sup>6</sup> model of international trade argues that countries exchange goods, capital and other factors of production because they have a comparative advantage in producing these items. Both countries benefit from trade because they can swap production factors that they have in abundance or can generate cheaply for those that they can fabricate only expensively or not at all. As applied to interstate labor migration, what the HOS model predicts is that

labor flows from countries that have a surfeit of it compared to capital to states that have a smaller ratio<sup>7</sup> of labor to capital (Öberg, 23-24). The national economies of both countries should improve in comparison to the no-trade scenario because the one with the labor shortage now has sufficient workers to maximize its production of goods and services and the one with the labor excess has relieved the pressure on its labor markets caused by having too many workers. In addition, the wage rates of the labor-exporting country should rise because employees are now a more expensive commodity, thus benefiting the people who remain behind. Finally, the migrants themselves should profit because they have left a country that has low wage rates for one where they are considerably higher (Massey et. al. 1993, 433; Tassinopoulos et. al., 13-16). Note that this approach truly does focus on the highest level of abstraction; the two countries involved in this trade benefit on the whole, even though some individuals in that economy might not profit from this exchange. That fact implies that each country's politicians may come under pressure from those who do not benefit from this exchange to protect them from economic harm. In other words, even though both countries' economies would benefit from this swap, these domestic political pressures<sup>8</sup> would prevent it from being realized.

For researchers who contend that individual-level reasons<sup>9</sup> for why workers leave their home country for another labor market are more important than interstate comparative advantage is, this high level of abstraction is not very satisfying. Micro-level neo-classical economic models (Wilson and Jaynes; Nahuis and Parikh; Giannetti; Profit; Dustmann et. al.; Boeri and Brücker 2000) focus intently on the determinants of, and barriers to, individuals moving from one place to another to find work. The basic

assumption of this approach, including the human capital model popularized by Sjaastad (1962), is that rational actors calculate the costs and benefits of changing labor markets and only move if the latter are greater than the former. Economic actors understand the quality of the investments they have made (or need to make) in themselves as potential workers, and migrate to the location where they can realize the greatest rate of return on those investments (Harris and Todaro, 126-127). They are also fully aware of the kinds of impediments (Todaro, 139-140; Kitching, 173-174) that stand in their way of moving, such as the search costs of a new job, language differences, and relocation expenses. Many micro-level studies have utilized wage differentials as a primary explanatory variable because the use of these data easily fits into the economic maximization assumption of rational actor models. In addition, these researchers sometimes segment migratory flow by age, gender, ethnicity, education, skill level, or some other variable in which they are interested. However, it is important to reiterate that these authors are concerned with individual-level wage differences rather than the macro-level economic disparities described previously (Massey et. al. 1993, 434-435; Massey et. al. 1998, 18-21; Öberg, 24-25).

The ostensible near-ubiquity of micro-level neo-classical migration theory explanations should not disguise the large amount of criticism of these models that has appeared in the literature, however (Ghosh, 99-101; Massey et. al. 1998, 8-11; Pryor, 117-120; Lucas, 85; Piore, 4-5; Favell et. al., 16-19; Dietz and Kaczmarczyk, 41-42; Fassmann, 178-179). The bulk of these criticisms can be distilled into three points, the first of which is the notion that wage differentials by themselves do not promote as much interstate labor migration as the theory might suggest. Given the huge gap that exists

between developed and underdeveloped economies, workers should be observed moving on a vast scale from one state or region to another as a regularized part of economic survival. However, as has been noted elsewhere in this work, labor-force participants are generally reluctant<sup>10</sup> to move even in the face of considerable wage differentials between regions or countries. Additionally, neo-classical economics models pay too much attention to the economic motives for why workers leave home for new jobs, according to critics. People leave their national labor markets for many reasons other than wage maximization, including family reunification, phase of life issues (e.g., college education, military service, marriage and divorce, retirement) and adventure (T. Brown, 5; Lee, 50-52). Reducing the act of migration to a simple economic calculus of costs and benefits omits or downplays these other rationales to the detriment of creating a complete picture of why workers leave their home markets. Finally, neo-classical economic theories of migration cannot explain well why migration continues once it has started. The notional expectation here is that migration levels decline as the wage differentials between two labor markets decrease and that worker movement does not cease entirely until that gap has been obliterated. However, empirical work in this area (Massey et. al. 1998, 9-10; Massey et. al. 1994, 701-711) indicates that migration does not end until living conditions in the labor supply country have improved to some minimal level of comfort. Other theories of migration also maintain that worker movement sometimes continues well after the economic reasons for its initiation have faded into memory due to the persistent consequences of family reunification policies and network effects. In sum, neo-classical economic theories of migration are a good starting point for discussing the motivations

for labor mobility, but they are not as complete of a picture of this phenomenon as their backers might believe they have constructed.

*New Economics of Migration*--An approach that has been developed recently in response to the alleged flaws of these micro-level neo-classical models is one that has been labeled the "new economics of migration" (Massey, et. al. 1993, 436; Massey, et. al. 1998, 21-34). This school accepts that economic actors can improve their situation by rationally estimating cost-benefit analyses on whether migration is a good strategy for accomplishing this goal. However, these researchers disagree with the neo-classical assumption that the relevant economic actor here is the individual worker. Their argument is that the household is a better unit of analysis for these studies because families generally attempt to maximize their collective income when debating whether someone migrates rather than just the individual who is deciding whether to leave. This seemingly minor assumption change permits new economics scholars to study a wider variety of strategies that households, especially those in the developing world, utilize to raise their relative economic status in their communities and minimize (or at least spread out) the risks that come along with migration. It also allows them to compare how developing and developed-world families cope with economic pressures and discuss what mix of strategies might be best for different kinds of households (Salt et. al., 75, 77; Massey et. al. 1993, 436-439).

*Historical-Structural Theories*--One similarity between all of these various economics-based theories, however, is that they all rest on behaviorist assumptions. In other words, institutional, social and historical constraints play very little role in determining whether and why labor shifts from one place to another, and a micro-level unit of analysis is

usually the focus of the work at hand. A rather separate set of approaches to studying migration is what Zulauf (2001, 21-22) terms the historical-structural school. These theories concentrate their attention on institutional, historical and structural explanations for why migration takes place and posit that the observed pattern of migration between states is the result of interactions between these macro-level incentives and constraints. For many of these researchers, migration occurs as a method of relieving the tensions caused by the interactions between these influences.

The first approach that falls under the historical-structural umbrella is dual labor market theory, which contends that labor demand from wealthier and more industrialized countries or regions drives the engine of migration. For a variety of reasons inherent to the structure of the labor markets of these developed economies, including the social status and pay of the available positions there, migrants generally take the lower-end jobs<sup>11</sup> in those countries. This observation implies that there is a two-tiered (dual) labor market in industrialized countries and that structural factors make employers dependent on migrants to fill positions in the lower half of the market. Since native workers are no longer willing to take these jobs at an economical wage but the positions need to be filled, employers must turn to migrant workers<sup>12</sup> as a last resort. This observation implies that in general native and migrant workers are rarely in competition for the same jobs despite fears to the contrary (Massey et. al. 1993, 440-444; Massey et. al. 1998, 28-32; Dietz and Kaczmarczyk, 38-48; Piore, 17, 27-49, 86-87). Another important set of historical-structural models of migration are the ones based on Immanuel Wallerstein's (1974) world systems theory. These studies employ as their theoretical foundation the concept that the most fundamental reason for interstate labor migration is the imposition

of capitalist economic relations on traditional, non-capitalist systems (Massey et. al. 1993, 444-447; Massey et. al. 1998, 35-37; Portes, 76-81; Zolberg 1981, 8-12; Meyers, 179-181). Again, the most important determinants of interstate labor migration are not those found at the individual level; rather, they are at the systemic level and are strongly shaped by historical factors that the economic approaches generally ignore.

*Important Implications of the Migration Initiation Theories*--What is really important about this abbreviated review of labor migration initiation theories, however, are the implications they hold for why workers do (and do not) move to a new market, the identity of those migrants, and what sorts of policies countries might implement to control labor migration into their economies. Both macro and micro-level neo-classical economic models agree that the primary reason workers decide to migrate is the rational calculation that they can successfully exploit the wage differential between their home labor market and the one to which they are traveling. In other words, only the conditions in the relevant national labor markets matter to a worker's migration decision, and migration does not cease until that wage differential is negated. Both types of neo-classical economic models also imply that skilled rather than unskilled employees are more likely to move from one labor market to another due to the former's greater human capital and ability to respond to the signals that interstate wage differences give them. Finally, these two theories imply that governments that want to control the influx of foreign workers into their systems can do so by altering the economic conditions in either country's labor market. Wealthy states can discourage migration by promoting development<sup>13</sup> in the poorer country, thus reducing the wage differential between the two markets, or by increasing the costs of migration through greater restrictions on foreign

workers and more rigorous enforcement actions against undocumented employees and the host-country companies that hire them. Countries that are facing a labor shortage in a booming region may also encourage migration by actively recruiting workers or by building infrastructure and making other investments that attract businesses and the concomitant need for labor migrants (Öberg, 23-27; Massey et. al. 1993, 434-436; Massey et. al. 1998, 19-21).

In spite of the considerable similarities between the inferences that can be drawn from the two neo-classical approaches, there are also non-trivial differences between them as well. First, micro-level models are more prone to take the likelihood that migrants find work in their new labor markets into account than macro-level models are since the latter often assume full employment in both economies. In addition to unemployment being more important to micro-level theories of migration, psychological constraints against and incentives for migration can be more easily addressed in these models because they are more concerned with why individuals leave for another market than macro-level models are. Finally, micro-level economic models can more easily utilize a number of reasons why individuals might shift labor markets beyond wage and skill differentials. Aside from the psychological inducements and barriers mentioned previously, changing social conditions, technologies, and state policies in the receiver or sender countries might make it easier or more difficult for workers to alter residences (Massey et. al. 1993, 434-436; Zelinsky, 223-226).

Despite the use of “economics” in its title, the conclusions of the new economics of migration school on the above points are quite a bit different from the ones of the neo-classical theories. First, as a result of new economics theorists’ change of the unit of

analysis from the individual to the household or family, these writers can now examine a wider range of strategies for dealing with economic disadvantage. In the neo-classical economics-based approaches, the rational response on the part of the workers in a poorer region to a wage differential between two places is migration (mediated by distance, the chances of host-country employment, and other costs of shifting locales). Wage differentials still matter in new economics models, but the rational reaction to them may be to send only some members of the family to the wealthier area while leaving others at home to work and depend on remittances from the distant household members. Complicating the strategies for how individuals react to migration incentives thus implies that wage differentials are not the sole determinant of labor migration. Workers may continue to shift locations even when the wage differential between two places disappears or may demur from moving even though the existence of a substantial wage differential would compel neo-classical models to predict that they would leave (Massey 1993 et. al., 438-440; Massey 1998 et. al., 21-27).

This observation has considerable bearing on both sender and receiver-country government policies towards limiting economic migration. Since a worker's migration decision is a function of household rather than solely individual incentives, government policies must be subtle in their approach to reducing motivations to move. An income increase that might dissuade one person in a household with a certain skill set from leaving might actually encourage another worker in the same family with different skills to leave. Another reason that all governments need to carefully tailor their programs to local conditions, according to new economics theorists, is their assumption that a household's objective of increasing its income is not just an absolute goal but a relative

one<sup>14</sup> as well. A receiver government's plan to augment income in an underdeveloped part of a sender country may have the perverse effect of increasing outmigration under certain circumstances. The idea that households monitor the incomes of other families in their community, and base their decisions on how to improve their situation relative to their neighbors on what they perceive, indicates that simplistic income-enhancement programs must be evaluated closely before they are implemented<sup>15</sup> (Massey 1993 et. al., 438-440; Massey 1998 et. al., 27-28).

*Labor Migration Perpetuation*--One similarity that all of the above models have, despite the many differences among their assumptions and implications, is that they generally try to explicate how labor migration begins. That observation may seem rather unremarkable, except that the reasons for why interstate labor movement begins may be rather different from why it continues. A separate set of theories and studies have therefore been produced to explain the perpetuation of labor migration. Their frameworks can be placed within the historical-structural school of thought because they all rely on the routinization of certain behavior patterns in the international migration system and the sender and receiver countries. The primary explanation for how interstate migration becomes perpetuated is network theory<sup>16</sup> (Wallace 1998, 29; Bauer and Zimmermann, 19; Recchi, 68; Hailbronner, 8; Kapur and McHale, 125-128; Portes, 73-74), which asserts that migration is easier for later workers from a certain region who leave for the same receiver area. Earlier laborers pay much higher costs and take much greater risks in leaving home for a new market because they are forced to locate housing and jobs in areas unfamiliar to them in the absence of the assistance of others who were once in their predicament. However, later migrants can readily plug into the networks established by

their predecessors to locate these resources, a distinct advantage especially when there are linguistic and cultural barriers between the new labor market and home. Even same-country migrants who do not originate in the region where the initial migrants are from can utilize this network to overcome these linguistic and cultural hurdles. Essentially, the “social capital” (Putnam 2000, 19-24) banked by earlier compatriots becomes a resource for later migrants, considerably reducing the risks and increasing the benefits involved in interstate labor movement. These later migrants are then expected to become part of that network and assist workers still at home to come to the receiver country and find jobs themselves, which helps to propagate this pattern still further (Massey et. al. 1993, 448-449; Massey et. al. 1998, 42-45; Salt et. al. 21-22).

A related perspective to network theory called institutional theory concentrates its explanatory attention not on the self-generated networks created by migrants, but on the secondary organizations that grow up around labor migration. Interstate worker movement generates a large and vigorous demand for a variety of legal and illegal services, opportunities that various entrepreneurs stand ready to exploit. These opportunities are especially plentiful in wealthy countries that issue far fewer worker visas than there are migrants willing to apply for them (Massey et. al. 1993, 450-451). Migrant networks and the institutions that develop around them are not the only ways that international labor movement becomes a self-perpetuating process. Cumulative causation theory declares that migration decisions modify the economic and social context in which later migration choices are made in ways that make worker movement more likely to occur. Many of these alterations, such as shifts in income, agricultural practices, the distribution of farmland, and the “culture of migration”<sup>17</sup> transpire in the migrant-sender

communities. In addition, the movement of the most skilled workers in a sender region to areas where they can reap the most reward from their human capital makes it more likely that future skilled workers will follow them because new industries that require such laborers will locate in the places where skilled employees already work. This process is part of a cycle that further impoverishes sender areas and reinforces the incentives for their workers to migrate (Massey et. al. 1993, 451-453; Massey et. al. 1998, 45-50).

*Important Implications of the Migration Perpetuation Theories*--Just like the historical-structural and economic theories of why migration starts, what is truly important about the competing descriptions of how migration continuation occurs<sup>18</sup> are the policy implications that can be derived from them, along with what they suggest about the incentives and disincentives that exist for workers to move to a new economy to take positions there. Network, institutional and cumulative causation theory all affirm that (in contrast to the economic, but like the historical-structural, theories of migration initiation) governments are seriously handicapped in their attempts to control labor movement. The perpetrators of worker migration lie largely outside the control of the state, especially the underground migrant networks created by laborers who enter the receiver country and the institutions that develop around them. In fact, government attempts to regulate labor migration often create perverse incentives and outcomes that nullify the effects of the original policies or make the problems the state wants to solve considerably more acute. For instance, cracking down on immigrant smugglers may lead to an even more expensive and clandestine system of migration that is further outside the view and control of the government. Family reunification policies designed to assist legal migrants in sponsoring close relatives for residency and encourage the proper method of migration

may inadvertently bolster networks designed to shelter illegal foreign workers. Basically, these theories contend that the underlying patterns that reinforce and propagate labor migration are strongly resistant to government intervention and only break down once the fundamental social, cultural and economic reasons for that movement disappear (Massey et. al. 1993, 449-451, 453-454; Massey et. al. 1998, 45, 49-50; European Commission 2006, 14).

To differing extents, all three continuation theories also argue that the feedback mechanisms that maintain migration relationships between countries become independent of the motives for their initiation, regardless of what those reasons were at the beginning of the process. Network theory in particular recognizes that while wage differentials might help jump-start labor movement between sender and receiver countries, those income differences soon become weakly correlated with migration flows because network effects quickly swamp out those of the wage differentials. Again, the migration patterns between countries become self-sustaining over time as they become more institutionalized and established. Finally, network and cumulative causation theory declare that although high-skill workers are generally the first ones to migrate, eventually the labor flow becomes more representative<sup>19</sup> of the sender community as a whole. This shift occurs because although workers with higher skills are attracted to the receiver countries first, the network created by those laborers reduces the costs and risks for lower-skill workers to arrive later (Massey et. al. 1993, 449-451, 453-454; Massey et. al. 1998, 45, 49-50).

*Migration Theory Literature Review Conclusion*--A brief reminder of where the present study fits within the literature<sup>20</sup> on CEE worker movement and the basic theories of

migration is appropriate after this lengthy theoretical discussion. In addition to following the precedents set by previous investigations specifically devoted to intra-EU migration, the present study should also find a reasonable place within the wider migration literature as well. In particular, the construction of the statistical and systems models and their component variables is based on a number of general migration theories. The factors and relationships of importance suggested by the various economics-based theories, especially the micro-level ones (e.g., unemployment and wage differences), are relied upon quite heavily. One of the advantages of modeling<sup>21</sup> is that relationships from a number of theoretical perspectives can be explicitly incorporated into the model successfully, which implies that insights from some of the historical-structural theories can be profitably utilized by this study as well. Much more is discussed about these points in the appropriate sections, but for now it is important to keep in mind that the current research is both firmly based in the mobility literature and exploratory in its approach to an important question inspired by the theories expressed in it. Finally, the kinds of economic, social and institutional policies that governments can use to retard or accelerate the amount of worker migration into their economies is discussed extensively here. The observable effects of some of these policies are examined explicitly using many different research tools, and are elucidated in great detail in the concluding chapter of this study.

### **History of European Labor Migration:**

Labor migration within Europe is not a new phenomenon, although its magnitude has grown and its speed has accelerated considerably in the past century. Agricultural societies, like much of Europe until the Nineteenth Century, featured rather

circumscribed mobility due to laws preventing it and the absence of information and resources that average people needed to decide whether and where to move for work. Barring a major natural disaster, political upheaval, or war, most workers did not leave the places of their birth for any reason, let alone a new job (Zolberg 1983, 232-234; Zelinsky, 224-226). Better transportation and media technologies, economic improvements fostered by the Industrial Revolution, the repeal of laws preventing worker mobility, and increasing population pressures created the first era of international labor movement during the Nineteenth Century. Much of the scholarly attention dedicated to this period has been expended on the large-scale shifts of workers from Europe to the Americas, Oceania and South Africa, but there was considerable intra-European worker movement<sup>22</sup> also. For instance, the 1880s witnessed large numbers of Belgians and Italians working in France and many Poles doing the same in Germany (Hatton and Williamson, 7-23; Meyers, 63-64; Zolberg 1983, 234-239; Bonifazi, 109). Late Nineteenth Century economies also experienced the first major wave of east-west migration as well; industrialized areas of France and Germany became important destinations for many CEE labor migrants<sup>23</sup> during this time (Fassmann and Hintermann 1998, 59; Wallace and Stola, 13). On the other hand, the first half of the Twentieth Century, for the most part, saw more restrictive legal regimes being placed on migrants to Western European countries. Although France maintained relatively open borders due to their labor shortages arising from the effects of World War I, other European countries (and the United States) raised the hurdles that immigrants had to surmount in order to access those labor markets. It should be kept in mind that these restrictions were not just on labor migrants; asylum-seekers and refugees also had more difficulty claiming

sanctuary during this economically depressed era (Zolberg 1983, 239-243; Meyers, 64-66, 86-88, 121-125). Europeans then lived through considerable population movement during and shortly after World War II, but not primarily for economic reasons. Tens of millions of people were displaced by the war's destruction or forcibly repatriated from one part of the continent to another; much of this shift took place from Eastern to Western Europe, but not exclusively (Bonifazi, 112-113; Wallace and Stola, 13-14; Fassmann and Hintermann 1998, 59-60; Zolberg 1983, 243).

*Post-World War II European Migration*--The situation that thus faced Western European policymakers and politicians in the late 1940s and 1950s, the time that the ECSC and EEC<sup>24</sup> were created, was that there had recently been large-scale, non-economically incentivized movement of people across the continent. At the same time, the devastation wrought by the recent conflict created considerable labor demand in order to rebuild both civilian and industrial infrastructure. These displaced persons did not necessarily possess the required skills to engage in that reconstruction process, so Western European politicians began to look to labor recruitment and free worker mobility schemes (see next section on EU labor policymaking) to fulfill their economies' needs. Many of these plans were strongly influenced by ethnic ties and imperial history; for instance, the UK sustained a liberal migration policy for its colonials, and the West German government strongly encouraged as many ethnic Germans (*Aussiedler*) to emigrate from behind the Iron Curtain as possible, during this time (Meyers, 67-68, 125-126). However, the German need for laborers was not fully satisfied by this policy, and so the first agreement for *Gastarbeiters* (guest workers) was struck with Italy in 1955. This labor recruitment accord would be the first of many with numerous Southern European and North African

countries that would result in the movement of millions of guest workers to West Germany between 1955 and 1973 (Meyers, 126-130; Salt 1981, 138-139; Schneider, 14; Bauer et. al., 206-211). France was also continuing to actively recruit labor from Southern Europe, especially Spain and Portugal, in the 1950s and 1960s. These efforts were taking place even as more than a million French citizens returned from Algeria and other former French colonies during these decades (Constant, 273; Bonifazi, 115; Recchi, 54-55). Decolonialization and the return of home country citizens to the metropole was a common occurrence between the 1940s and 1970s, as many millions of French, British, Dutch, and Portuguese citizens left their colonial abodes to take up residence in Europe. These imperial links also became the basis for natives of those former colonies' claims on moving to their former mother countries. In fact, the UK was forced to place limits on the ability of Commonwealth citizens to move to the UK in the 1960s in response to the demand for that privilege (Meyers, 69-70, 88-89; Bonifazi, 115; Salt 2001, 1).

However, many of the labor recruitment schemes and liberal immigration policies of the first few post-war decades were severely curtailed or even canceled in the face of the oil crisis-related recessions of the 1970s. Most famously, the West German government halted all labor recruitment efforts in November 1973 in response to these altered economic conditions (Bauer et. al., 273; Zolberg 1983, 243; Schneider, 14; Tapinos, 53-54). The next fifteen years or so featured half-hearted host-government attempts to encourage established guest workers to return to their home countries and a general increase in restrictions on migration of all types. Even family reunification policies became controversial, and considerably less liberal, during this period due to the chain migration that these procedures created. Additionally, the last of the

decolonialization-motivated returns from Africa and Asia took place, further depressing the perceived need for West European immigration (Schneider, 14-15; Bonifazi, 116; Meyers, 70-73, 90-94, 130-133; Bauer et. al. 213-215; Constant, 274). The accession of Greece, Spain and Portugal to the EC also took place during this time period; not surprisingly, this situation generated increased public concerns<sup>25</sup> about mass labor migration within the previous member states. The policy response to this development was to impose long transition periods on the free movement of the new member-state workers. As it happens, there is little evidence that these derogations were necessary, as there were no great inducements for these workers to move either before or after the expiration of the transitional periods (Boeri and Brücker 2000, n; Salt et. al., 43-48).

*Post-Cold War European Migration*--The collapse of the Soviet Union's control over Central and Eastern Europe in 1989 and the instability caused by Yugoslavia's and the USSR's demise in the early 1990s ushered in a new era of migration in Europe, and not just of workers. For instance, this period witnessed an enormous spike in the number of asylum-seekers to Western Europe; more than three million applications for asylum were received in those countries during the first part of the 1990s (Messina and Thouez, 109). The main political consequence of this flood of asylum requests was for the Western European countries to greatly tighten their standards for granting safe haven. Additionally, even though only a small proportion of these requests were ever granted, these sudden, unexpected and mammoth inflows of migrants created considerable consternation among Western European publics (Meyers, 74-75, 96-101, 133-135, 166-168; Bauer et. al., 215-218; Bonifazi, 119; Schmeidl, 72-73; Schneider, 15; Uçarer 2002, 15, 18-22). Although the power to review requests for and grant asylum rests in the hands

of the EU member states, the organization as a whole tried to help them coordinate their responses to this huge influx of asylum-seekers. The primary EU-level policy response on this matter during this period was the Dublin Convention of 1990. This accord, which like the Schengen Agreement was technically created outside of official EU institutions but was later integrated into EU law, set the standards by which the country making this decision would process the claim. Essentially, the Dublin Convention is designed to stop asylum-seekers from “shopping around” for the easiest country in which to gain protected status by forcing them to apply for it in the first safe country in which they arrive (Hailbronner, 51-52, 382-386; Gondek, 197-208; Messina and Thouez, 100; Loescher, 37-39; Kunz and Leinonen, 140-142; Uçarer 2002, 25-26). Simultaneous with the large-scale arrival of these asylum-seekers in Germany was a huge influx of *Aussiedler* from Central and Eastern Europe and the massive “internal” post-reunification shifts of citizens of the former East Germany to the western part of the country (*Übersiedler*). The German government reacted to this situation by tightening not just the rules for granting asylum but also their regulations governing the ability of ethnic Germans from outside of the country to settle there (Bauer et. al., 223-225; Meyers, 133-137, 141-143; Stola 1999, 141; Morokvasic, 3). What does not appear to have happened, however, is an uncontrollable flood of CEE labor migrants to the markets of the EU15 countries. While there was an increase of CEE workers in these economies during the 1990s, it was at nowhere near the scale that was commonly predicted. Although it is possible that this observation is partly due to a data figment since the short-term movement of workers is often not caught by the data sources on migrant labor and this type of movement was starting to displace long-term shifts during this time, it still intimates that workers are

more likely to stay in their home countries than many pundits and scholars would assume (Salt et. al., 17-27; Bonifazi, 120; Stola 1999, 142-144).

The overall European migration pattern<sup>26</sup> and pressures that faced the EU as it prepared to welcome the CEEC8 into its membership in 2004 were therefore fairly complex. Although historically (Hatton and Williamson) most European countries have been countries of emigration, the economic reality at the turn of the century was that they were immigrant attractors and probably would be for some time to come (Salt et. al., 17, 22-26; Messina and Thouez, 106-107). For instance, Germany, whose government insisted for decades that it was not a country of immigration while at the same time recruiting millions of guest workers, recognized that it was one when it eased its naturalization requirements in 2002 (Schneider, 12-13; Bauer et. al., 197; Meyers, 133, 156-158). West European countries such as Spain, Portugal, Italy and Greece that had been net exporters of labor to wealthier states for decades have begun to attract many economic migrants from Eastern Europe, Latin America, Asia and Africa (Bonifazi, 119-120; Schneider, 15; Cangiano and Strozza, 164-171). Even the CEEC8 economies that the EU15 governments were so concerned about being sources of migration are finding that they are becoming, or soon will be, immigrant attractors as well (Bijak et. al. 148; Wallace 2002, 606-613; Salt 2001, 10-11; Lavenex and Uçarer, 8). In fact, during the 1990s and early 2000s, the CEE countries became the locus of a complicated set of migration patterns of their own, featuring transit migrants, short-term migrants<sup>27</sup> and cross-border commuters, small-scale traders, asylum-seekers and some permanent migrants (Wallace and Stola, 23-37; Bonifazi, 122; Salt et. al., 23-24; Ruspini, 183-186; Recchi, 69-70; Okólski and Kozłowski, 16-22, 24-25; Maresová and Grumlik, 36-37;

Juhász and Toth, 41-46). This change in perspective is difficult to accept for the voters of many EU15 and CEE countries, and as implied earlier there has been considerable political backlash to this notion (Schneider, 9-11; Wallace 2002, 618-621; Meyers, 108-109, 158-160; Constant, 275; Maas, 96-100; van Amersfoort, 80-82).

*Some Preliminary Notes on Early Post-Accession CEE Labor Migration*--Once CEEC8 accession became a reality in 2004, both the newer and older member states braced for the labor migration consequences of that event. As it turned out, some surprises were in store for both the academics who study this behavior<sup>28</sup> and the politicians who must deal with its consequences. As mentioned previously, the UK, Ireland and Sweden declined to implement the optional derogation on the free movement of workers from the 2004 CEE accession countries. The release of an EU-sponsored study (European Commission 2006) that showed that these three countries performed better economically than the rest of the EU15 states that kept worker movement limits in place in the mid-2000s and the perceived lack of an initial burst of labor migrants even in the UK (Portes and French, 4) persuaded four more EU15 states<sup>29</sup> to scrap their restrictions in May 2006 (Economist 2006; Partos; Kunz and Leinonen, 148). In particular, the Commission study reports that CEEC8 labor migration flows had positive effects on public finances, economic growth and employment rates in the EU15 countries; in addition, CEE workers are apparently complements to EU15 workers, not substitutes (European Commission 2006, 14). It is fascinating that these conclusions hold even for the UK, which took the brunt of CEEC8 labor migration; if there had been any sizeable negative effects on the labor markets of a receiver country, they should have appeared here, but they did not. This situation became so positive that by May 2009, every EU15 member state except Germany and Austria had

allowed their derogations on CEEC8 labor movement to lapse (Economist 2009b). However, the subsequent political responses to Bulgarian and Romanian accession on the question of free worker mobility to the older EU countries varied in reaction to member-states' post-2004 experiences; while the UK, Ireland and most of the EU15 countries adopted curbs on this right, Sweden, Finland and eight newer member states<sup>30</sup> extended free labor mobility to the newest members right after their accession (BBC News 2008; Drew and Sriskandarajah).

Interestingly, this situation where some countries kept their restrictions in place and others did not created a natural experiment: would their continued existence in most of the EU15 countries and their lifting in three others deflect CEEC8 migrants to the latter member states? The answer to this question seems to be a qualified yes; while the UK<sup>31</sup> has received far more CEE migrants than they expected based on a Home Office study (Dustmann et. al., 2003), the evidence from Ireland and Sweden is more mixed (Zaiceva, 17-21; Boeri and Brücker 2005, 14-16; Doyle et. al., 10-14; Ruhs, 10-12; BBC News 2006). However, the large number of “new” migrants reported by the UK might be misleading, as it is widely suspected that many CEEC8 workers who had been laboring in the UK illegally or in the gray market simply registered their presence once they could do so without penalty (Ruhs, 8; Portes and French, 14-15; Gilpin et. al., 13-14; Bijak et. al., 135; European Commission 2006, 11). In addition, the Worker Registration Scheme under which CEE labor migrants are counted by the UK government only measures gross inflows of these workers; in other words, there is no requirement for CEE workers to deregister when they leave the UK (Portes and French, 16). There is also some evidence of a diversion effect in that the UK presently attracts the majority of CEE labor migrants

and the portion going to Germany and Austria has decreased considerably (Brücker and Damelang, 14-16). However, any evaluation of this observation needs to be tempered by an awareness of the data problems discussed in this paragraph and elsewhere in this dissertation.

This set of events has two critical implications for previous models of labor migration and the ones constructed by this research. First, politics and institutions matter; the CEEC8 migrants reacted to different member-state rules about labor movement in a rational fashion, and politicians have some indication that they can affect how many people come to their country to work. These politicians are not able to stop labor migration entirely, but they know that they can create policies that change the calculus of foreign workers who are deciding whether to move to another economy. Second, the distribution of where migrants settle may not be the same in the future as it was in the past if the rules affecting those choices change. Boeri and Brücker's (2000, 126) assumption that this distribution would remain constant could be problematic, so future migration models should be designed to take the possibility of these shifts into account. *Illegal Immigration to the EU*--As implied by the earlier discussion of CEE workers in the UK, not all labor migrants enter the EU15 economies legally. Although irregular labor migrants are not a new problem in Europe and it is almost by definition difficult to acquire reliable data on illegal immigration, it is fairly clear that the scope and magnitude of this problem has increased considerably over the last few decades (Salt 2001, 22-28; Salt et. al., 17; Messina and Thouez, 109-110). Bolstered by the European public's aversion to illegal immigrants, the policy response to this social problem at the member-state level mostly has been to crack down on them and make it more difficult for illegal

immigrants to assimilate into their host societies (Schneider, 10-11). Even though asylum and immigration policy were transferred from the third to the first pillar by the Amsterdam Treaty, the EU has been limited by sovereignty issues, political concerns, and national opt-outs from engaging in too much centralized policymaking in this area. The EU has managed to help limit illegal immigration by strengthening the external Schengen border by funding and assisting member states with land and sea border patrols through the FRONTEX program, however (Schneider, 23-24, 29; Messina and Thouez, 112; Maas, 87; Miller; BBC News 2009b). These policies, along with the EU's work in the asylum policy area, has led to some criticism that the organization is trying to create a "Fortress Europe" against outside invasion (Meyers, 220; Zimmerman 1995, 45). The idea here is that while the free movement of EU workers is actively encouraged inside the fortress, the organization does its best to prevent any worker who is not already a citizen of one of the member states from enjoying that freedom (Lavenex and Uçarer, 5).

According to these critics, this pattern of behavior is inconsistent and possibly unfair at some level (Loescher, 37-38; Kunz and Leinonen, 153-154). On the other hand, skeptics of the EU more generally would assert that the organization is not doing enough to protect its member states from illegal immigration and that the free movement of workers is a bad idea altogether (Lungescu 2007; Kunz and Leinonen, 146-147). All of these arguments are framed against a backdrop where many demographers contend that Europe as a whole needs to encourage more immigration from outside the continent in order to maintain its countries' generous welfare states. To these scholars, because of longer life-spans and reduced fertility, in a few decades there simply will not be enough active workers to fund the retirement programs that European workers currently expect in their

old age. Although this solution to this problem is not perfect, not the only one available, and politically difficult to implement, increased immigration might be a vital component of saving these programs (Coleman 2002, 49-59, 64-73; Münz and Straubhaar, 122-123, 144-150; Holzmann and Münz, 233-241; Schneider, 18-22; Hailbronner, 19-20; Bijak et. al., 149). In short, EU member-state politicians face some knotty short and long-term trade-offs when it comes to dealing with current and future European migration patterns.

### **EU Labor Migration Policymaking:**

The question then becomes one of what kind of assistance they can expect from their EU-level partners in handling these issues. Labor migration has been a feature of European Union policymaking and treaty-writing from the genesis of the organization (Haus, 287-289). In fact, the notion of free worker mobility influenced the negotiations over the creation of both the ECSC and EEC. Under the Treaty of Paris that fashioned the ECSC, coal and steel workers from all six member states were afforded the right to take jobs in any member state. However, true free mobility of these workers took several more years of negotiations and considerable political expenditure on the part of the Italian government to accomplish (Maas 12-17). Although these consultations had been lengthy and controversial, a precedent had been set, so when negotiators of the 1957 Treaty of Rome that founded the EEC wanted to include provisions for the free movement of all non-public sector workers, they were seen as an extension of a principle that was already in place on a small scale rather than a radical new idea. It took another decade of transitional periods, Commission pronouncements and negotiations, but in 1968 private-sector EEC workers gained in principle the right to move to any member-state economy to ply their trade (Recchi, 57-58; Maas, 17-22). However, there remained considerable

technical barriers to free movement, including national rules about certificate and diploma recognition, that prevented many skilled personnel from working outside their home countries (Schneider and Claessens, 136-159). These obstacles were not completely dismantled until the implementation of the Maastricht Treaty in the 1990s. Additionally, as mentioned elsewhere, the 1997 incorporation of the Schengen Agreement into EU law at Amsterdam represented the final step in removing obstructions to EU-wide worker mobility. Schengen essentially erased the EU's internal borders, allowing workers to travel from one member state to another for employment as easily as journeying from one part of their own country to another for that purpose (Recchi, 58-62; Dinan 2003, 29; Dinan 2005, 103-112, 118-123, 391-412; Uçarer 2007, 306-307; Kunz and Leinonen, 138-140, 142-143; McCormick, 150-151). These major milestones in EU labor migration policymaking<sup>32</sup> were supplemented by various pronouncements of European Council meetings on legal and illegal migration throughout the 1990s and 2000s, including the Tampere, Seville and The Hague gatherings (Meyers, 218-219; Schneider, 22-31).

However, the recent EU labor migration policy that has attracted the most attention (and one that greatly concerns the present research) is the derogation on the ability of CEEC10 workers to travel to EU15 countries to take up employment. This provision was included in the accession treaties of the 2004 and 2007 new CEE member states at the insistence of EU15 negotiators who were concerned about the possibility of large-scale worker movement from these entrant countries. The structure of this derogation is a bit more complicated than the normal description of this stipulation, which is to affirm that current member states can block the free mobility of CEE workers for up to seven years after their countries' accession, so a more detailed examination of

this proviso is in order. For the first two years of this period, the current member-state governments can keep whatever policies they had in place at the time of the signing of the accession agreements without any interference from the Commission. At the end of this time, however, the member-state governments are required to inform the Commission about what policies they plan to maintain for the next three years. After a total of five years, the only legitimate way that a member state may preserve the labor mobility derogation for another two years would be if it were faced with either the threat or reality of a significant labor market disruption. However, the application of this derogation is voluntary; a member state may drop it<sup>33</sup> at any time of their choice. At the conclusion of this seven-year time frame, new member-state workers must be treated just like those from the older member states (van den Bogaert, 60-61; European Commission 2006, 3-5; Drew and Sriskandarajah; BBC News 2008; Bijak et. al., 130-131; Kunz and Leinonen, 148). As can be observed, what this policy has meant for CEEC10 workers is that they have faced a patchwork of rules that has shaped their migration decision-making. For the EU15 member-state governments, this derogation has given them an opportunity to protect their constituents from competition, ignore it to make a statement about the value of EU expansion, or even forego it at a politically opportune time.

*EU Migration Policymaking Goals*--At the concluding stages of this discussion of European labor migration and EU labor migration policymaking, it is worthwhile to summarize what the primary policy goals of the organization are in this area. Although these principles (Staples, 118; Wood and Yeşilada, 231-232) have not been explicitly asserted thus far, they have remained not too far in the background. In short, EU policy in this field should:

- 1) encourage greater European economic growth, stability and integration through the free movement of EU labor (human capital) as an important factor of production;
- 2) promote improved understanding<sup>34</sup> between EU citizens and a pan-European identity through enhanced and increased contact between citizens of the various member states;
- 3) prevent political instability caused by large-scale population movements from rural to urban areas or from poorer to wealthier parts of the EU. This instability could be caused by the “hollowing out” of these poorer or isolated regions, the overdevelopment of urban centers, or the fears of current job holders that economic migrants are going to take their positions;
- 4) reduce illegal economic migration from outside the EU, while still maintaining a humanitarian policy that permits legitimate political refugees and persecuted individuals to claim asylum in EU member states;
- 5) interdict the importation of illegal drugs, stolen goods and other prohibited items and halt human trafficking for the purposes of black-market employment, including prostitution;
- 6) coordinate member-state cooperation on all facets of intra-EU and external migration policy, including areas where the members still have exclusive competence.

What is immediately evident about the items on this list is that several of these goals conflict with one another or contradict legitimate EU goals in other policy areas. For instance, preventing economic and political instability by protecting certain job holders from competition by labor migrants diverges from the larger goal of encouraging greater overall economic growth and efficiency in the organization. Restricting the movement of workers, even temporarily, also makes it more difficult for European citizens to meet with and improve their understanding of one another. Obliterating customs and passport checks between EU member states, as happened after the implementation of the Schengen Agreement, also complicates EU and member-state efforts to apprehend illegal immigrants once they have crossed the EU’s external borders. Finally, securing the Schengen external borders against illegal migration and other illicit activities complicated and disrupted the new CEE member-states’ relationships with their eastern and southern neighbors that were not joining the European Union in the near future (Jileva, 79-80; Grabbe 2002, 92-93, 98-101; Bort, 4-16). This policy shift made it more challenging<sup>35</sup> for

the CEE candidate countries to have generally positive interactions with their bordering states, an important part of the Copenhagen membership criteria. Ultimately, EU politicians have had considerable difficulties balancing the demands of these policy goals, and that has shown in at least some of their decisions in this policy realm.

*EU Member-State Migration Policymaking Goals*--Another important matter concerning the above list is that at least some of the EU's goals as listed there complement and conflict with the objectives of EU member-states' migration policies. Again, although a reasonable list of member-state migration policy ends has not yet been produced explicitly (Kapur and McHale, 7-9, 37-39), these goals have been implicit in the past discussion. In terms of these guiding principles, member-state migration policy should:

- 1) encourage both short and long-term economic growth and stability by filling skill gaps in the domestic labor supply, persuading the "best and brightest" workers from other countries to move there, and ensuring that there are enough current workers to support social welfare programs for past workers;
- 2) integrate new workers into their societies, should they be permanent migrants, or at least not alienate temporary workers from their host-country's political system;
- 3) be sensitive to the political and economic demands of the host-country's workers in terms of labor competition and peace;
- 4) limit illegal economic migration from outside the country while still maintaining a humanitarian regime for legitimate asylum-seekers and refugees;
- 5) impede the importation of illegal goods and human trafficking;
- 6) help to maintain (or at least not worsen) the political relationships between the member state and its neighbors.

While points one and four through six should look familiar as one peruses the earlier roll of EU labor migration policy goals, the second and third purposes on each list are quite different. In relation to point two, despite the creation of certain limited citizenship rights for EU member-state citizens, power over traditional citizenship policy<sup>36</sup> lies in the hands of the EU member-state governments. The EU may be trying to create a form of pan-European citizenship, but it is up to the member states to decide who has access to that

citizenship through their own naturalization and integration policies. Different EU member states have pursued quite different policies in this area over the last several decades, and some have even changed tack during that time (Meyers, 156-158), but in all cases the EU has had practically no influence over the sort of citizenship policies that their member states have adopted and implemented. Again, while the EU might be trying to create a supranational European identity and citizenship without respect to nationality, its member states determine whether and how migrants join their own national polity and thus potentially the emerging European one. Superficially, both third points address building and maintaining political stability, but they do so at different levels. The EU is concerned about this matter on a Europe-wide level, and because of that fact it is unclear who the intended audience (e.g., member-state governments, Eurocrats, European-level politicians) is for these policies, although it is unlikely<sup>37</sup> to be the member-states' voters. The member-state governments and their politicians need to deal with these matters at the national level, and they know exactly who their audience is: their constituents, who could oust them from office at the next election should they create a policy that their voters do not like. In conclusion, these conflicts between the EU's migration policy objectives and its member-states' migration policy goals animate many of the controversies and difficulties that have haunted this policy area over the past several decades and are likely to be matters that affect both groups' collective future.

#### **Methods of Forecasting Migration:**

Before this study<sup>38</sup> can describe specific previous forecasts of probable post-accession CEE labor migration to the EU15 countries, it is vital to explore more generally how previous researchers have made conclusions about the size and composition of this

phenomenon. Given the amount of political excitement that the prospect of CEE accession created in popular discussions<sup>39</sup> of its repercussions for worker movement, Veil's (1998, 85-86) observation that the free movement of persons had not been the focus of much systematic research up to that point might seem surprising. However, several important forecasts<sup>40</sup> of how many CEE workers the EU15 countries might reasonably expect were concluded within just a few years of Veil's remark (Dustmann et. al., 30-33). Three basic approaches<sup>41</sup> to projecting CEE labor mobility potential can be identified in that literature (Boeri and Brücker 2005, 12-13; Bauer and Zimmermann, 31-37, 44-47; Salt et. al., 84): estimates based on survey data in the sender countries; projections derived from similar experiences in different parts of the world, including the European Union; and extrapolations that result from econometric models.

*Survey Estimates*--The easiest path to determining how many people from the CEE accession countries plan to move to the EU15 countries to seek work would seem to be to ask them about that question directly. The responses to those inquiries would then assist host governments in planning for labor migration to their countries. This approach was attempted in a comprehensive way for the CEE accession countries, as well as a few others, most notably by Fassmann and Hintermann (1998), Wallace (1998) and Krieger (2004). However, trying to extrapolate actual worker mobility from survey data is notoriously difficult due to a number of factors. First, the gap between what survey subjects state they plan to do on this score and what they actually do is considerable (Wallace 1998, 30-31; Fassmann and Hintermann 1998, 61; Bauer and Zimmermann, 35-36). It is easy to say to a pollster, even in a face-to-face interview, that one plans on leaving home for a job in another country, but it is something else entirely to actually

depart. Partially, this fact is due to another difficulty with using survey data to predict worker mobility, which is that they only give the researcher information on the push factors that impel people to migrate and little data on the pull factors that attract them to certain countries. In other words, survey data grant researchers some idea of what conditions are like in the home country of the respondents, but relatively little information on the social, political and economic circumstances of the receiver countries where those workers might relocate. Finally, many survey questions may not capture the temporary nature of much economic migration (Dustmann et. al., 29-30; Lord Wright, 22; Salt et. al., 84) in that simply asking workers “Are you interested in taking a job in another country?” does not indicate how long they plan on remaining abroad. Wallace (1998, 80-81) tries to escape this constraint by explicitly building a time element into her survey questions, but Krieger (2004, 10) is unable to follow suit. In summary, results based on survey data may permit interesting insights into patterns of migration intention, but their results must be taken with a large modicum of caution given the problems that exist with this method (Boeri and Brücker 2005, 12).

*Extrapolations from Earlier Migrations*--The second common method of predicting CEE population flows into the EU15 countries, extrapolation from previous experiences with worker migration, is in some ways an extension of existing comparative research on past migration patterns (e.g., Muus and van Dam). Basically, the results of prior occasions where the EU experienced the threat of massive labor migration are used as the basis for projections for what might happen in the new case. In the instance of Layard et. al. (1992, 6, 24), the EU’s experiences with southern to northern European migration between the 1950s and 1970s are utilized as the foundation for an educated guess that at least three

percent of CEE workers would move west if given the opportunity. Salt and his co-authors (1999, 89-90) employ the emigration rates of the then-current EU15 member states to construct something they call a “Western Normality Index” and apply those emigration rates to several of the 2004 accession countries. These authors determine that about three percent of the CHEPS (Czech Republic, Hungary, Estonia, Poland, Slovenia) countries’ populations would move west over the first fifteen years after accession, a figure that is roughly in line with Layard et. al.’s results. Salt and his co-authors then conclude that although their methodology might have problems, their results are probably more realistic than the terrifying numbers that were being derived primarily from survey data at that time.

A more formalized use of a previous instance of worker migration in the EU to forecast the CEE case is found in Bauer and Zimmermann (1999, 44-46). In this piece, the authors use EU labor migration figures from Greece, Spain and Portugal before and after their free movement restrictions were lifted to calculate estimated coefficients of how various economic factors (unemployment and GDP differences) might affect CEE labor migration. These coefficients are then utilized to create estimations of potential labor emigration rates to the EU from a number of CEE accession states. A general difficulty with this approach, however, is that one could argue (Boeri and Brücker 2001, 1, 3-5) that the baseline cases employed by these studies are so different from what they are being used to explain that the projections are inaccurate. In particular, one could contend that the EU labor market was in equilibrium with relation to workers from the southern expansion states at the time the restrictions on their mobility were dropped, implying that their abolition should not have caused a sudden increase in their presence in

those markets. Since that condition was very unlikely to be true at the time of the CEE member states' accession, Bauer and Zimmermann's approach is questionable (Boeri and Brücker 2000, 119-120; Boeri and Brücker 2001, 12-13).

*Econometric Models*--Finally, a frequently used method of predicting the magnitude of CEE worker migration has been to estimate this figure using econometric and statistical models (Bijak et. al., 2008). These studies employ a number of different estimation procedures, including pooled OLS and GLS with both fixed-effects and heterogeneous estimators. Many of the analyses described below are econometric models, and they are explored in considerable detail momentarily. However, one problem that they all share is that their estimators are borrowed from other contexts because regularized CEE migration<sup>42</sup> is such a relatively new phenomenon. The implication of this procedure is that these researchers are forced to assume that these coefficients are appropriate and invariant across both time and space. As has already been asserted, that assumption may not be correct and implies that one must approach the results of these studies with some caution (Boeri and Brücker 2005, 12-13; Brücker and Siliverstovs, 737).

#### **Previous Estimates of CEE Labor Mobility:**

Perhaps surprisingly given how controversial this topic has been, many of the models of CEE worker migration (regardless of the estimation method) generally conclude that the EU15 countries could have expected a long-term (ten to thirty-year) total population flow equal to two to four percent of the sender-countries' populations<sup>43</sup> into their labor markets. Not every estimation agrees with this consensus, which is a vital reason for the existence of the present study, but many of them do (Alvarez-Plata et. al., 8; Boeri and Brücker 2005, 11). The earliest of these investigations, and one that apparently laid the

intellectual groundwork for many of those to follow, is the Layard et. al. (1992) piece that estimates that around three percent of the CEE's population would move to Western Europe within the next fifteen years. This assessment is an extrapolation from Western Europe's experiences with population movement from Southern Europe during the early years of the EEC/EC and the amount of migration from Mexico the US has encountered. Since east-west movement was such a rarity during the Cold War, Layard cannot use past occurrences of this particular phenomenon to project a figure. Still, Layard and his co-authors feel confident in making this prediction because it is based on the economic and political conditions that motivated the two long-term instances of population movement cited earlier. The problem with this estimate, however, is that it seems to be little more than an educated guess because there is no formal statistical model or other rigorous technique behind it. Despite this fact, this forecast has been an influential one for later studies that project CEE worker mobility into Western Europe.

*European Commission Models*--For understandable reasons, policymakers at the European Commission and in the governments of the EU15 countries were intensely concerned about what sorts of worker and generalized population movements they could have expected from the CEE accession countries once they were inside the organization. This problem was felt especially acutely given the relative dearth of official, systematic quantitative or qualitative research done into European Union population movements described in the conclusion to Veil's report (1998, 85-86) on this matter. To address this question, the European Commission's Directorate-General for Employment and Social Affairs authorized a group of academics led by Boeri and Brücker (2000) to study how eastern enlargement might impact the labor markets of the EU15 member states. In their

final report and in two follow-up papers released in 2001 and 2005, these authors contend that, under reasonable assumptions about economic convergence between the EU15 and CEEC10 member states and the magnitude of other relevant economic variables (e.g., GDP growth, unemployment), a maximum of four percent of the total population of the new member states would move west within the first thirty years after the restrictions on labor mobility are dropped (Boeri and Brücker 2000, 126-131; Boeri and Brücker 2001, 10-13). This figure seems to be quite large, although in reality it only represents around one percent of the total population<sup>44</sup> of the EU15 countries in 2000. While these authors do not wish to imply that the effects of this migration would be negligible, especially since some countries (like the CEE “border states” of Austria and Germany) and labor markets (especially those for low-wage, low-skill employment) would be more greatly impacted than others, the fears of an EU swamped by Central and Eastern European workers are probably unfounded (Boeri and Brücker 2001, 12-14).

Boeri and Brücker’s basic econometric model in these analyses is a time-series model founded on Hatton’s (1995) examination of emigration from the United Kingdom in the four decades prior to World War I. Since Germany was the country of destination<sup>45</sup> for about two-thirds of CEE migrants in the most recent year (1998) the authors have relevant data, Boeri and Brücker first estimate the number of migrants who would arrive in Germany for the first thirty years after the free labor mobility policy is implemented. Then, based on the percentages of CEE nationals in the other EU15 countries in 1998, the authors predict the number of such migrants who would move to each of these member states over the same time period. The authors feel confident in taking this step because national patterns of migration are generally stable over time due to networking effects

(Boeri and Brücker 2000, 113-116; Massey et. al. 1993, 448-449). In short, Boeri and Brücker assert that the total consequences of eastern expansion on EU15 labor markets would not be insignificant, but they would be manageable without adopting radically obstructionist policies, even in the case of CEE worker mobility (Boeri and Brücker 2000, h-n).

Since CEEC8 enlargement was postponed until 2004, however, the Commission wanted to ensure that not enough had changed in the circumstances surrounding the EU15 labor markets and their relationships with CEE workers that the original report's results had been invalidated. Therefore, the Employment and Social Affairs directorate-general commissioned a follow-up report a few years later to examine this question.

Alvarez-Plata and her co-authors (2003) discover that relatively little had shifted in terms of the migration conditions between the EU15 and CEE countries in the few years since the Boeri and Brücker piece had been written. While the German economy (and that of the EU in general) had not performed as well as the original model predicted, and increased economic growth in the CEEC10 had decreased the GDP gap by more than the original authors believed would happen, these differences are not large enough to change the overall extrapolation that declares that less than four percent of the CEEC10's population would move to the EU15 countries in the long run. In fact, the new report asserts that this number should be slightly less by a fraction of a percent (Alvarez-Plata et. al., 7, 9, 50-51). The one outcome of this new analysis that might be contradictory to the previous results is the evidence that is derived from at least one of these authors' models about the future distribution of CEE labor migrants in the EU15 economies. In one of their models, Alvarez-Plata and her co-authors find that the German share of the

CEEC10 workers would be less than half of the sixty percent<sup>46</sup> predicted by Boeri and Brücker's work. However, the new report's authors believe that this result is nonsensical and do not use it to project labor migration potentials for the entire EU15 region (Alvarez-Plata et. al., 56). In general, however, this follow-up report confirms the results of the earlier European Commission study of the question of CEE population migration potential (Alvarez-Plata et. al., 55-56).

*Other Consensus Pieces*--Three other pieces that use different methodologies from the European Commission's reports but agree with their two to four percent long-term donor-country migration conclusion are Bauer and Zimmermann (1999), Brücker (2001), and Krieger (2004). The first pair of authors employ a similar accession experience to the CEE situation, the period in the 1980s when the EU admitted three southern European countries (Greece, Spain and Portugal) into the organization, to estimate migration determinant coefficients. These figures are calculated for the periods before and after labor mobility restrictions were in place for these three countries and then applied to a number of CEE countries' populations. Despite some reservations on their part due to the even worse economic situation the prospective CEE member states were in compared to the southern European ones, Bauer and Zimmermann conclude that a reasonable expectation for CEE migration is that two to three percent of their populations<sup>47</sup> will leave for Western Europe in the long run (Bauer and Zimmermann, 44-47). Brücker (2001, 32, 52), however, pursues a somewhat different tack to arrive at a similar conclusion. He takes emigration data to Germany from eighteen different countries and estimates coefficients that he uses to project thirty-year CEE migration potential to Germany. Since at that time Germany was by far the most popular destination country for

CEE labor migrants (Boeri and Brücker 2000, 113), the author can then make broader statements about East to West European labor migration using these figures. In fact, he determines (Brücker, 48) that Germany should expect between two and three percent of the CEEC10's population to migrate during the period in question, thus hinting that fears of mass labor migration from Eastern to Western Europe are unfounded.

A survey-based forecast<sup>48</sup> of CEEC10 migration can be found in Krieger (2004), who argues that despite the huge methodological differences that exist between a survey-based and econometric study of this question, his results are in line with those of the Boeri and Brücker (2000) contribution. First, Krieger's measure of short-term (five-year) migration potential predicts that just over one percent of the CEEC10's population could move within that time frame, which corresponds with what Boeri and Brücker (2000, 127) maintain. Additionally, Krieger's gauge of long-term migration potential (which he labels "general inclination" and "basic intention" to move) furnishes him with a band between 1.8 and 3.7 percent of the target population that may leave home<sup>49</sup> in the distant future. This prediction is also in accord with what the official European Commission reports conclude, again despite the serious divergence in approaches here. Krieger acknowledges that there are noteworthy limitations on his methods, some of which are inherent in using surveys and some<sup>50</sup> that are unique to his work. However, the author is certain that his results can be usefully compared to those of the commonly-cited econometric models (Krieger, 16-18).

*Low Previous Estimates*--It is vital to keep in mind that not every forecast of CEE labor movement concurs with the two to four percent boundaries discussed above. In fact, a few systematic studies predict that a smaller percentage of population movement would

occur, perhaps a surprising admission given the amount of political concern expended on this topic in the years immediately preceding CEEC10 accession. For instance, after briefly mentioning that despite these public worries about CEE workers there is very little in the social scientific literature that tries to make a reasonable estimate of their migration potential, Fertig (2001, 707-708) sets about trying to correct that oversight. He creates a time series model, also based on Hatton (1995), that tests the predictors of long-run migration into Germany and then utilizes them to estimate future migration patterns into that country from the CEEC10 accession states. The author<sup>51</sup> discovers that just over one percent of the population of these countries would move to Germany during the first twenty years after their accession (Fertig, 717-719). Since in the 1990s Germany was the most popular target country for CEE migration by far (Boeri and Brücker 2000, 126), one could extrapolate from Fertig's results to conclude that overall EU15 migration from these states still lies below the lower-bound consensus figure (Boeri and Brücker 2005, 11; Alvarez-Plata et. al., 26). In short, Fertig contends that EU15 politicians and publics should expect a mild influx of workers on the order of their experiences with the southern enlargement of the 1980s (Fertig, 719). A survey-based investigation into the question of CEE labor migration potential that posits a smaller figure than the consensus one is Fassmann and Hintermann (1998), which is essentially a summary of a much larger piece written on the same subject (Fassmann and Hintermann 1997). These authors argue that the realistic migration potential<sup>52</sup> of Poles, Czechs, Slovaks and Hungarians lies approximately between one and two percent of each country's working-age population and at 1.43 percent of their overall population (Fassmann and Hintermann 1998, 62). Although larger projections of movement are possible from their data, these authors

conclude that their lowest figure is the most likely because these respondents have taken concrete steps towards realizing their goal of leaving their home country to work in another place; i.e., they have applied for a work or residence permit in their destination country (Fassmann and Hintermann 1998, 61-62).

Another research effort that forecasts a smaller-scale CEE population migration than that of the consensus figures is a report commissioned by the UK Home Office that appeared just before CEEC8 accession (Dustmann et. al.). These authors create an econometric model to establish the determinants of population inflow for Germany and the United Kingdom based on historical immigration patterns from other parts of the world. The determinant coefficients that result from this procedure are then used to forecast CEE migration for the first ten years after CEE accession in a pattern similar to Fertig (2001) and Bauer and Zimmermann (1999). What Dustmann and his co-authors predict is that relatively few CEE citizens are likely to move to either Germany or the UK after their countries become EU member states. In fact, the authors explicitly state (Dustmann et. al., 57) that their predictions for Germany are at the low end of what previous studies have found and that the numbers for the UK are even smaller than that. Despite the problems inherent in this study, the authors are certain that CEE migration is unlikely to be excessively large (Dustmann et. al., 8, 52-59). Although these results concern only two EU15 countries, Germany and the UK, one could extrapolate these results for the rest of them and calculate a CEE migration potential figure below the band settled on by the greater part of the relevant literature (Boeri and Brücker 2005, 11). *High Previous Estimates*--Just as there are forecasts that predict that a smaller percentage of the CEEC10 workforce would shift west once eastern accession occurred than the

scholarly consensus contends is reasonable, there are also some that forecast that a much larger percentage would move. In the years before CEEC8 accession, the popular press and many politicians speculated that twenty, forty or even fifty million<sup>53</sup> Central and Eastern Europeans would flood the EU15 countries, causing havoc in the host countries' labor markets and welfare systems (Bauer and Zimmermann, 1; Krieger, 3; Alecke et. al., 64). To put that in perspective, the consensus projection percentages forecast a shift of around 2.0 to 4.5 million CEE labor migrants in the long term (Boeri and Brücker 2001, 12; Boeri and Brücker 2005, 13-14). More reasonable systematic high-end estimations<sup>54</sup> can be found in the literature, however; perhaps the best example of this type of result is Sinn et. al. (2001). This piece builds an econometric model of CEE migration to Germany using that country's experience with population movement from Turkey and the EU southern enlargement countries. The authors then predict that over the first fifteen years after CEEC10 accession<sup>55</sup> that four to five million people from those countries should arrive in Germany. Based on this estimation, the authors conclude that the German government should adopt policies that would delay CEE workers' ability to freely access the German labor market (Sinn et. al., xvi-xviii; xxiii-xxiv). When extrapolated to all of the EU15 countries, however, this estimate would forecast a CEEC10 migration potential equal to twelve to fifteen percent of their population. Alvarez-Plata and her co-authors (2003, 8, 26) contend that this vast figure is exceedingly unrealistic. These authors fault the Sinn group's use of a common constant term in their forecasts, a problem which Alvarez-Plata and her co-authors believe led to Sinn et. al.'s upwardly biased estimates.

A similar problem haunts Flaig's (2001) work on this topic; he starts from a similar place as Sinn et. al., utilizing the migration history of five Mediterranean countries to create his migration determinant estimators. Flaig then employs these parameters to forecast the long-term level of migration from several CEE countries to Germany. These results parallel<sup>56</sup> what Sinn and his co-authors (2001) discover, but the lack of country-specific constants in his forecast equations makes Flaig's estimators suspiciously high also (Alvarez-Plata et. al., 26). Finally, an interesting short-term projection of CEE population migration potential can be found in Hille and Straubhaar (2001), who determine that this annual figure could reasonably lie between 0.2 and 0.4 percent of these countries' population. This figure might seem extremely high, especially given that Boeri and Brücker's (2000, 112) highest projected figure is four percent total over thirty years. However, as Hille and Straubhaar are completely willing to admit, this short-term percentage may go down after a few years as migrants become adjusted to their new situations and economic convergence makes moving to the EU15 countries a less compelling option (Hille and Straubhaar, 84-85, 95).

*Critiques of CEE Migration Projections*--As might be imagined given the difficulties inherent in forecasting any event, the many estimates of labor migration from some or all of the CEEC10 economies to the EU15 member states have attracted a considerable amount of criticism (Kupiszewski). Some of these negative assessments appear above, but others remain to be discussed in this section. For instance, one of the most powerful critiques of these extrapolation studies is that they are based on double out-of-sample estimates (Zaiceva, 11; Alecke et. al., 70). In other words, since the CEE countries were walled off from normal migration patterns during the Cold War (Stola 1999, 140-144;

Fassmann and Hintermann 1998, 59-60), there is little past history to guide the creation of estimators for future movement. An approximation of what those numbers might have been if history had been different must first be calculated (often by analogy to similar historical events) and then those estimators are utilized to project future mobility, thus creating double out-of-sample estimates. Another methodological criticism of much of this literature revolves around the notion that the use of improper estimation techniques may lead to faulty labor migration forecasts (Alvarez-Plata et. al., 26). In particular, Brücker and Siliverstovs (2006, 749) argue that fixed-effects and Bayesian estimators outperform procedures like pooled-OLS or instrumental variable estimators. Even the definition of “migration potential”, especially as the term is used in survey estimates, is strongly brought into question by some authors (Kupiszewski, 634-636). This term is a new one in the study of demographics and worker movement, and as such does not have a commonly accepted definition. That fact implies that scholars define this phrase in their own ways, creating some potentially serious problems when comparing research results from various efforts.

Practical problems with projecting labor movement are another focus of various researchers’ criticisms of past studies in this area. Quality data availability problems (Salt et. al., 86-87; Brücker and Siliverstovs, 737) are a serious challenge to labor migration studies, although the situation today is somewhat better than it once was. An issue specific to examinations of labor migration to Germany, and projections to the rest of the EU15 countries based on these figures, is the fact that the magnitude of these flows might be distorted by the return of ethnic German *Aussiedler* from Eastern Europe in the early 1990s. For all realistic purposes, however, that migration source is now exhausted, so

German policymakers should not expect to see movements at those levels in the future (Kupiszewski, 632-633; Meyers, 141-143). Even when suitable data are available, some trenchant criticisms exist concerning how those data are employed. For instance, several authors (Kupiszewski, 637-638; Bijak et. al., 132-133; Salt et. al., 87) contend that most econometric forecasting models do not grant sufficient explanatory attention to non-economic variables, especially demographic ones. The difficulty with this practice is that it might lead to overestimates of labor migration, including predicting sizeable mobility from areas whose demographic profiles (Coleman 1993, 526-545) would not support such a proposition (e.g., predicting that many people would move from an area with mostly elderly residents or with a small overall population remaining after many years of migration). Another complexity arises in deciding what kind of migration should be under investigation by the research in question. In general, studies of worker movement examine permanent labor migration; additionally, some studies only consider gross (unidirectional) flows rather than net. These choices could lead to overestimates of labor migration and ignore the intricacies of temporary migration, including cross-border commuting<sup>57</sup> and seasonal work (Hárs et. al. 2004, 262; Kupiszewski, 628, 638). In short, the combination of questionable assumptions, ad-hoc specifications and definitions, and untenable methodologies allegedly creates a literature littered with improbable results (Kupiszewski, 627-630, 642). This study is cognizant of this critical literature and attempts to address at least some of its concerns in constructing the models presented in the new research chapters, but it is confident that it can add something positive to the study of labor migration within the European Union.

**Conclusion:**

One of the appeals of a large-scale research project like the present one is that it can pause to thoroughly appreciate the complexity and breadth of the literature into which it is trying to fit. This review has attempted to accomplish that feat in three distinct ways. First, several important theories of labor migration (neo-classical economics, new economics of migration, dual labor market theory, network theory, cumulative causation) and their observable implications have been described in great detail. As stated earlier, these theories both compete with and complement each other, and the inferences that one can derive from several of these theories is used to justify the models constructed and tested in subsequent chapters of this work. Second, the history of European labor migration and goals of EU migration policymaking have been briefly but thoroughly reviewed. As demonstrated in that discussion, the history and patterns of these peacetime movements should have allayed any serious fears about the magnitude of labor migration that would follow CEEC10 accession to the EU. Finally, the results of the specific forecasts of CEE labor migration to the EU have been explicated in sufficient detail to demonstrate that there were a wide variety of these predictions in the literature. The divergence of these results illustrates the need for a more thorough and partially reconceptualized projection of CEE worker movement to the wealthier EU member states. Fortunately, now it is time to end this break in the proceedings, however, and move on to the new empirical research chapters on the migration of CEE workers into the EU15 countries.

Table 2.1 Summary Information Concerning Previous Forecasts of CEEC10 Migration

Author(s)/ Year	Estimation Method	CEE <sup>58</sup> Sender (Donor) Countries	Target Area	Estimated Migration Flow
Alvarez-Plata et. al. (2003)	Econometric	CEEC10	EU15	3.6 percent in 2004-2030
Bauer and Zimmermann (1999)	Extrapolation	BU, CZ, HU, PO, RO, SK, SV	EU15	2-3 percent in long run
Boeri and Brücker (2000)	Econometric	CEEC10	EU15	4 percent in 2002-2030
Brücker (2001)	Econometric	CEEC10	Germany	2-3 percent in 2002-2030
Dustmann et. al. (2003)	Econometric	AC10	UK, Germany	5,000 to 13,000 to UK, 20,000 to 73,000 to Germany, over 10 years
Fassmann and Hintermann (1998)	Survey	CZ, HU, PO, SK	any country	≈700,000 over unknown time
Fertig (2001)	Econometric	CEEC10	Germany	≈1 percent over 20 years
Fertig and Schmidt (2000)	Econometric	CZ, ES, HU, PO	Germany	300 to 400 thousand over 20 years
Flaig (2001)	Extrapolation/ Econometric	CZ, HU, PO, RO, SK	Germany	>3 million over 15 years
Franzmeyer and Brücker (1997)	Extrapolation	CZ, HU, PO, RO, SK	Germany	680,000 per year to 2030
Hille and Straubhaar (2001)	Econometric	CEEC10	EU15	0.2-0.4 percent per year
Krieger (2004)	Survey	CEEC10	EU15	990 thousand over 5 years
Layard et. al. (1992)	Extrapolation	non-Soviet Eastern Europe	EU15, EFTA	3 percent over 15 years

Table 2.1 (continued):

Author(s)/ Year	Estimation Method	CEE Sender (Donor) Countries	Target Area	Estimated Migration Flow
Orłowski et. al. (2001)	Econometric	CEEC10	Austria	187 to 302 thousand over 10-12 years
Salt et. al. (1999)	Extrapolation	CZ, ES, HU, PO, SV	EU15	3 percent over 15 years
Sinn et. al. (2001)	Econometric	CZ, HU, PO, RO, SK	Germany	4 to 5 million over 15 years
Straubhaar (2001)	Extrapolation	CEEC8	EU15	1.5-2.0 percent over 15 years
Wallace (1998)	Survey	BU, CZ, HU, PO, SK, SV (and others)	any country	no data
Zaiceva (2006)	Extrapolation/ Econometric	CEEC10	EU15	3-5 percent over 10 years

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<sup>1</sup> To illustrate the complementary nature of the various theories of migration in the literature on this subject and the confused nature of its state of play, Massey and his co-authors (1998) closely examine almost every theoretically-informed study of migration that they could locate. What they discover is that there is evidence from nearly every region of the world supporting virtually every theory of migration in existence (Massey et. al. 1998, 106-107, 132-133, 158-159, 193-195, 219-221). The results of studies from some regions tend to support some theories over others, but there is no way for these authors to distinguish which one of these theories would be best more generally based on the studies and data that were in the literature at the time of their assessment.

<sup>2</sup> Two older theories of migration that are not given much attention by this literature review are demographic transition theory (Zelinsky) and gravitational (distance) models (Óberg, 38-39). Demographic transition theory argues that modernizing societies endure population growth bubbles that come about when mortality decreases due to health-care and other technological improvements but fertility does not decline in the face of this new reality. The large number of workers who are caught in that bubble cannot find jobs when they enter the workforce and are thus induced to migrate elsewhere to survive. Gravitational models (Ravenstein 1885, 1889, cited in Lee, 47) state that, analogously to any two objects in Newton's theory of gravity, the attractiveness of a particular destination to migrants is inversely proportional to the distance between the migrant's home and destination regions. As a result, the observed volume of migration from one place to another decreases with distance. Although this insight is often used as a control variable in studies of migration (e.g., Borjas), it is of a descriptive rather than explanatory nature and thus probably does not belong in a discussion of the theoretical explanations of migration (Óberg, 39; Straubhaar 1986, 837; Pryor, 117; Böhning, 35-36; Hárs et. al. 2004, 262).

<sup>3</sup> A bit of an elision or quietly stated assumption in the literature should be observed here, which is the fact that net migration is sometimes utilized as a proxy for permanent worker movement and gross migration is utilized as a shorthand for temporary worker movement. In neither case is that always true; temporarily contracted workers may happen to be present in an economy when the relevant data are collected and thus add to the net migration total, whereas some more permanent "gray-market" workers may be missed by those figures entirely (Kupiszewski, 628-630, 637-642). However, because permanent migration increases the stock of foreign workers in an economy and thus the net migration rate, this equivalency is not completely unreasonable. Although cross-border commuting and short-term migration are increasing in importance in Europe (Salt et. al., 86; Okólski, 105-106; Wallace 2002, 611-613), permanent or long-term labor migration remains the greater concern of politicians and publics due to what that activity implies for the receiver and sender-countries' politics and cultures.

<sup>4</sup> Please note that systems modeling does permit one to track both gross and net migration simultaneously; this information can then be used to explore the effects of both types of migration volume on the policies of the countries under study and how those figures are in turn affected by those policies. This point is returned to in some detail at the end of the systems modeling background section in Chapter 4.

<sup>5</sup> A similar statement could be made about the phenomenon of cross-border commuting, an extremely short-run form of labor migration if one looks at it that way (approximately eight hours per workday). This practice is becoming more common in Europe (Salt et. al., 86), but it is unlikely to cause much controversy and it is not new or unique to Europe. Suburban commuters to urban centers are an everyday sight in the developed world, and although there may be some resentment between urban and suburban dwellers associated with questions of tax burdens and service use, that sentiment is unlikely to turn into the equivalent of the sort of nationalist backlash that permanent migration can create. In a borderless, post-Schengen European Union, crossing national borders is somewhat similar in effect to crossing state borders in the US, and cross-state commuters are quite common there. Again, although there may be some discord between the commuters and natives of these states, it is doubtful that this friction would create the equivalent of a nationalist backlash. Finally, the author recalls taking the equivalent of a commuter train between France and Germany near Strasbourg in the early 1990s while he was traveling during foreign

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study. The phenomenon of cross-border commuting is not a new one if the French and German transportation authorities had set up a commuter line between them that many years ago.

<sup>6</sup> For a detailed application of the HOS econometric model to international labor migration, including within the EU15 context, see Basu (2004); a briefer application of the Heckscher-Ohlin model to this topic on a global scale can be located in Kapur and McHale (2005, 70-71).

<sup>7</sup> One might also expect that capital would shift from countries that have a lot of it compared to labor to those in the converse economic position. Foreign investment by developed-world companies into the developing world, although a controversial change associated with globalization, should therefore not be a surprising event. Capital, in the form of technology upgrades, can also substitute for labor, implying that reducing the supply of labor through immigration limits may cause employers to invest in laborsaving devices that actually reduce the number of jobs available to local employees. That result represents the opposite of what is logically intended by reducing external competition for jobs through more stringent economic immigration rules, and indicates that perverse outcomes may occur in this area if policymakers do not carefully consider the consequences of their actions (Tassinopoulos et. al., 15-16).

<sup>8</sup> A topic of considerable contention in studies of the type attempted by this analysis is the notion of the substitutability of trade for labor migration. A basic tenet of the HOS model described in this section is that they are substitutes for each other in the same way that capital and labor mobility are interchangeable (Razin and Sadka, 14-26; Holzmann and Münz, 254-255). The underlying idea here is that increased trade between a wealthier and a poorer country will improve economic conditions in the latter, thus providing jobs for workers who would otherwise be induced to move to the former to find employment (Bissell and Natsios, 310-312). In European Union development assistance policymaking, this idea is often found in conjunction with policies that encourage foreign direct investment in, and traditional development aid to, poorer states (Muus and van Dam, 36-37; Lavenex 2002, 168; European Commission 2002, 21-23). As is discussed elsewhere, concerns about large-scale labor migration from post-Cold War CEE to the European Union existed almost from the first day after the collapse of the Berlin Wall, but so has the suggestion that increased EU-CEE trade and CEE economic prosperity might reduce the need for it (Layard et. al., 51-61; Razin and Sadka, 25). The goals of discouraging pre-accession CEE labor movement both directly through continuing EU member-state limitations on it and indirectly through greater unrestricted EU trade with that region were advanced by the "Europe Agreements" that were negotiated between the potential CEE member states and the EU in the 1990s. These documents promised far more EU direct development aid to the CEEC10 and open trade in goods between the CEEC10 and EU than they did free worker migration between them (Dinan 2005, 146-147; Friis, 187; Peterson and Smith, 202-203; Barros, 120-122). Although it has been asserted that a basic function of all free trade organizations, including the EU and North American Free Trade Agreement (NAFTA), is to reduce migration potential through the economic development of their poorer members (Massey et. al. 1998, 283-284) and the EU has used cohesion policy for this reason for decades, the EU's leadership apparently could not state that position officially during the CEEC10's accession preparations. One could speculate that reticence existed because the EU's leaders understood that the citizens of the successful applicant countries would someday have the right to move to any EU economy to take work, a right that the Commission is supposed to encourage EU workers to exploit. This seeming reluctance to make explicit what is deducible from their actions can be readily contrasted with the very public proclamation by NAFTA's negotiators that it was designed to improve economic conditions in Mexico to the point that its citizens would be less likely to migrate to the United States or Canada (Muus and van Dam, 68-70; Smith, 136-138). In fact, the Mexican president who negotiated NAFTA, Carlos Salinas, was quoted publicly as stating that he hoped that Mexico would now be exporting "goods and not people" through the anticipated expansion of the *maquiladora* complexes on the US-Mexico border (Massey et. al. 1998, 284). However, the question still remains whether labor migration and trade are substitutes for, or complements of, one another. Even though the HOS model strongly argues in favor of the former position and Holzmann and Münz (2006, 254) contend that they were substitutes in the case of the CEEC8 at the time of their accession, at least a few scholars would promote the latter stance, especially for low-skill employment (Holzmann and Münz, 254-255). In fact, Landesmann (2001, 106-108) claims that the literature's lack of exploration of this controversy for the CEE economies in the years before their EU accession has created one of the great unresolved questions related to this event.

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<sup>9</sup> There are many individual-level reasons for people to migrate (e.g., maximization of economic gains, marriage and family reunification, the furtherance of one's education), not all of them rational (Lee, 50-57; T. Brown, 5). However, one motive that hardly ever appears in this discussion is politics (T. Brown, 29). Aside from expellees or refugees (Lee, 56; Schmeidl), people rarely move for strictly political reasons. In other words, Democrats seldom move from one part of the United States to another just to live near other Democrats, for example. The partisan nature of the place where one chooses to live may play a role in the final living arrangements selection (i.e., one may choose to settle in a Republican rather than a Democratic neighborhood in the same city), but it is very unlikely that the move itself is initially motivated simply by politics.

<sup>10</sup> In fact, Massey and his co-authors (1998, 10) suggest that the "propensity to move," which is a standard idea that labor migration researchers are trying to examine, should be replaced with the propensity to stay put, as that is the more common response to wage differentials between labor markets.

<sup>11</sup> Of course, migrant workers must earn more in their new labor markets in order for them to overcome important obstacles to leaving their old ones (T. Brown, 5). Although dual labor market theory concentrates its theoretical attention on the more structural reasons for migration, it does not deny that individual workers can rationally calculate whether moving is in their best interests (Massey et. al. 1993, 443-444).

<sup>12</sup> It is easy to aver that alterations in the structures of modernized economies have made three previous sources of what Piore (1979, 86-93) refers to as marginalized workers--peasants, housewives and students--less available or attractive to companies as temporary hires than in previous decades. Modernization of farming technology has meant that rural laborers have entered the regularized workforce en masse and have permanently moved to urban areas (in other words, there is less underemployment in rural regions than there once was). Stay-at-home parents are much less common than they once were, with most working-age families in the US having (or at least trying to have) dual full-time incomes. Additionally, fewer young people are working their way through school as parents support them more generously so they can concentrate on their studies more fully. While it is true that many subsistence farmers, students and stay-at-home parents still define themselves by what they do outside of the workplace and some of them do supplement their incomes with irregular or part-time work, this pool of competition to migrants for lower-end jobs is not as deep as it once was (Massey et. al. 1998, 32-33) .

<sup>13</sup> As stated previously, the primary purpose of the EU's cohesion funds (Wood and Yeşilada, 173-184; Dinan 2005, 373-384) is to create exactly that sort of migrant-discouraging economic development in the depressed parts of the EU. However, the program has long been troubled by charges of political favoritism in the determination what projects the EU supports and is thus not viewed favorably by many citizens of the EU who provide tax money for these efforts.

<sup>14</sup> This concept is derived from relative deprivation (RD) theory in the social movements and political violence literature (Gurr, Davies, Canache). Basically, RD theorists contend that absolute poverty and deprivation do not cause conflict; rather, it is only when people perceive a relative difference between their status and that of another group that social movements and political violence occur. According to new economics theorists, relative income deprivation shapes the income acquisition strategies (including migration) of households in many countries.

<sup>15</sup> As one might imagine, the conclusions and implications of the historical-structural theories are at considerable variance from those of the economics models. The dual labor market and world systems approaches both contend that demand-side determinants of labor migration are the dominant explanations for why workers move from one country to another. Supply-side reasons (like political instability in sender states) might play some role here, but the developed economies' need for low-wage migrant labor is built into the international system. That fact implies that the wage differentials between wealthier and poorer regions that played such a huge role in determining migration decisions in the economics models have little explanatory power in the historical-structural theories. Those differences may grow, shrink or remain static, but as long as rich capitalist economies need immigrant workers, they will be recruited from outside those

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wealthy states. The engrained nature of the requirement for inexpensive-labor migration also suggests that governments, especially those of receiver states, have scant incentives to stanch the tide of low-wage workers in the international system. Since these governments owe their survival to continued domestic economic growth, and the corporations that guarantee this growth require migrant labor to prosper, receiver states (and the sender-country governments that depend on them) would be shooting themselves in the foot to take any serious steps to halt mass interstate labor migration. (A world systems or dual labor market theorist would likely argue that this observation helps to explain why American immigration policy remains relatively open even under considerable domestic political pressure and rhetoric to seriously restrict it.) For these theorists, industrialized- country political institutions can at best shape the origins of that migration and direct it to certain parts of their territory. In short, it is not as if developed country governments could not do more to cut down on the number of workers who come into their labor markets; it is that they are unwilling for important economic and structural reasons to do so (Massey et. al. 1993, 444, 447-448; Massey et. al. 1998, 33-34).

<sup>16</sup> The concepts encompassed by network theory appear under multiple names in the labor migration literature. They could also be referred to as the family and friends effect, friends and relatives effect, chain migration, or path dependency (Massey et. al. 1994, 729; Hatton and Williamson, 14, 17; Boeri and Brücker 2000, 128).

<sup>17</sup> This term refers to expectations in sender regions about the likelihood of workers moving elsewhere to find jobs. The first few migrants must overcome considerable resistance to the idea of going abroad to work, but as they prosper and return far wealthier than before or send remittances back home, others will try to emulate that success and depart as well. Eventually, it may even become the norm that most laborers, especially young ones, relocate to a receiver country at least temporarily to work (Massey et. al. 1993, 452-453). The gradual creation of this pro-migration culture is an important part of cumulative causation theory. Of course, economic setbacks for these workers in their host countries, such as those that occurred during the European recession of the late 2000s, may slow or even reverse the flow of workers to, and remittances from, these targeted economies (Broomby; Donadio and Schwartz).

<sup>18</sup> Massey and his co-authors (1993, 454) describe a fourth perspective which they call “migration systems theory,” which seems to be a generalization of the conclusions of network, institutional, cumulative causation, and world systems theories. The most important idea that can be sifted from this approach is that sender and receiver countries establish stable and intense systems of migration and exchange over time. These systems can be multipolar as well as bilateral, and can change as the economic, social and political conditions that spawn them evolve.

<sup>19</sup> Note that this idea does not necessarily contradict the comment in the description of cumulative causation theory that higher-skill workers are disproportionately attracted to migration centers (Massey et. al. 1993, 453). Migrant networks that reduce the costs of moving for lower-skill workers do the same for more skilled workers; just stating that the labor flow becomes “more representative” of the community does not imply that it ever becomes perfectly characteristic of its skill distribution.

<sup>20</sup> One matter of interest here is to note that a major purpose of Massey et. al. (1998) is to review the state of play in the migration literature at the time of its writing using the various theoretical perspectives that they describe as an organizational strategy. The various studies that they examine are also broken down geographically by region (Europe, the Gulf states, Asia, North and South America). From the authors’ point of view, there are relatively few theoretically-grounded studies in the empirical migration literature that they scrutinize (Massey et. al. 1998, 293).

<sup>21</sup> Of course, concepts from multiple theories can be incorporated into both statistical and systems models, but the structure of systems modeling allows that to happen more openly. In fact, that openness is true of all computational models more generally (Taber and Timpone, 43-44).

<sup>22</sup> Massive intrastate European labor movement, often from rural to urban areas, was also occurring during this time; for example, by the mid-Nineteenth Century almost one-quarter of the industrial workers in

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Scotland and England were from rural southern Ireland, which at the time was still part of the UK (Zolberg 1983, 237).

<sup>23</sup> Substantial intrastate east-west worker movement was also taking place during this period, too. As the capital of the Austro-Hungarian Empire, Vienna attracted laborers from poorer parts of the empire like Moravia, Galicia and Bukovina (Fassmann and Hintermann 1998, 59).

<sup>24</sup> The purpose of the European Coal and Steel Community (ECSC) was to create a common market in these two materials that are so important to a country's war-making abilities and to rationalize these industries. Its founders hoped that multistate control over these industries would make fighting future European conflicts more difficult. The European Economic Community was designed to encourage interstate trade, and thus peaceful relations, between its participants by reducing tariff barriers between the member countries. The EEC and Euratom, a group that encourages pan-European cooperation in the nuclear energy industry, were created by two separate Treaties of Rome in 1957 (McCormick, 65-69; Wood and Yeşilada, 15). The six countries that constituted the EEC, Euratom and the ECSC were West Germany, France, Italy, Belgium, Netherlands and Luxembourg (Rifkin, 201-202).

<sup>25</sup> By contrast, neither the 1973 accession of the UK, Ireland and Denmark to the EC nor the 1995 accession of Austria, Sweden and Finland to the EU impelled the organization to impose labor movement restrictions on its newest member states' citizens. These limitations were generally considered to be unnecessary because of the relative economic parity of the countries involved and because workers in the 1995 enlargement-round countries had already enjoyed free mobility through their countries' membership in the EEA. For similar reasons, Iceland's potential EU membership is also unlikely to produce demands for a labor migration derogation on that country's workers (Hailbronner, 30-32, 221; Salt et. al., 43; BBC News 2010).

<sup>26</sup> One might be tempted to argue here that EU countries are finding themselves in a similar situation as American cities are (Peterson, 25-27) in that they have lost control over who can move there for work. However, as shall be seen shortly, EU member-states are still able to regulate the migration of people from non-EU countries; in EU parlance, these individuals are referred to as third-country nationals or TCNs (Staples, 3-5, 10-12; Lavenex and Uçarer, 6). Like their American city-level counterparts (Peterson, 27-29), they can also implement policies that attract and repel different kinds of companies (and thus EU workers) from moving to their cities and regions.

<sup>27</sup> Okólski (2001, 106-107) summarizes this short-term movement, including peddling and small-scale trading, under the term "incomplete migration" and claims that this phenomenon is new to the study of labor mobility. Basically, this migration is unfinished because permanent settlement in the receiver country is not a goal of the workers or their families; in fact, the length of their stays is often on the order of days and weeks, not years. However, this foreign employment is a major factor in their households' incomes and the cumulative effect of many of these short stays is that they are abroad for considerable stretches of time.

<sup>28</sup> Obviously, one cannot at this point weigh whether the consensus figures of population migration were correct because insufficient time has passed (and that would obviate an enervating purpose of the current research). However, some interesting observations can be made about the size of the early CEEC8 labor migrant population and its distribution in the EU15 countries. It might also be tempting to conclude at this point that the restrictive policies worked and thus were necessary, but there are few reasonable ways to prove this counterfactual.

<sup>29</sup> Portugal, Spain, Finland, and Greece abandoned the CEEC8 worker mobility derogation in May 2006 (Economist 2006; Partos; Kunz and Leinonen, 148).

<sup>30</sup> The ten member states that permitted the free movement of Bulgarian and Romanian workers upon those two countries' EU accession were Finland, Sweden, Cyprus, Czech Republic, Estonia, Latvia, Lithuania, Poland, Slovakia and Slovenia (BBC News 2007). As of April 2009, at least four more EU member states

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had allowed these workers to freely take jobs in their economies: Greece, Hungary, Portugal and Spain (BBC News 2009c).

<sup>31</sup> There is now at least some evidence to suggest that the influx of CEE workers to the UK seen just after the 2004 accessions is ending due to appreciating CEE currencies and an economic slow-down in the UK. This state of affairs is a decidedly mixed blessing for British workers and employers as the 2012 London Olympics rapidly approach (Broomby; Cox; Chappell et. al., 18-27, 41-42; BBC News 2009a).

<sup>32</sup> An excellent summary of the state of the current EU migration area and the unanswered questions that still exist related to it can be found in Ruspini (2008). At least some of the effects of European Court of Justice case law on the development of EU policies concerning the free mobility of EU workers, other EU citizens, and third-country nationals can be located in Schneider and Claessens (2005), van den Bogaert (2005), van der Mei (2005), Staples (1999), and Hailbronner (2000).

<sup>33</sup> EU countries that suddenly found themselves facing serious labor market disruptions after voluntarily forsaking this derogation are permitted to reimpose it during the seven-year transition period by invoking a safeguard clause. However, older member states are under an obligation to not make the rules facing a new member-state's workers any more difficult than they were at the time of the signing of that country's accession treaty (van den Bogaert, 61; European Commission 2006, 4).

<sup>34</sup> The earliest proponents of European integration subscribed to liberal international relations theory in that they argued that military conflict would be less likely among countries that traded more, and populaces that met one another more often, than those that did not. In this sense, it could be stated that the free mobility of labor is part of the EU's plan to ensure that war does not again sweep across Europe (Dinan 2005, 13-14; Doyle, 1153, 1161-1162).

<sup>35</sup> In fact, the toughening of the applicant countries' external visa regimes was one of the most controversial parts of the CEEC10 accession process as it proved costly for these potential member states in terms of their relations with their non-candidate neighbors. The 1990s saw strong economic ties develop between several of the accession countries and their eastern and southern neighbors; these connections were disrupted by the process of securing the new external frontier of the European Union. Accession also threatened to disturb rejuvenated ethnic ties between nations that had been divided by state borders (e.g., between Poland and Ukraine or Romania and Moldova) over the course of the Twentieth Century (Andreas, 103-104; Lavenex 1999, 154-158; Bort, 5-8; Bobinski, 238; Grabbe 2002, 99-100; Grabbe 2003, 84-87; Kiss, 85-87; C. King, 260-264; Lieven, 304-305; Jileva, 79-80; Melis, 194-195; Salt et. al., 73; Wallace 2002, 606, 615).

<sup>36</sup> Traditional citizenship (i.e., access to full voting rights, member-state government employment and passports, and non-employment related social welfare benefits) policy and the determination of who qualifies for access to these citizenship benefits remains under the sole and exclusive control of the member states (Maas, 93). Although EU politicians and bureaucrats commonly speak of European citizens and citizenship, there are no such creatures in the typical sense of that term. The EU is not a state, and the people who live in the EU's member states are citizens of those countries. EU member-state citizens may (in certain situations) access the consular services of other member states, may vote and stand in European elections regardless of whether they live in their home country, and carry a similar burgundy-colored passport. However, these features do not make them "citizens" of the EU in the usual sense (McCormick, 149, 154; Maas, 50-52). In short, the granting of member-state citizenship, and thus access to EU "citizenship" benefits, is a task left wholly to the governments of the EU's members.

<sup>37</sup> This assertion relates back to the "democratic deficit" thesis, the argument that because many EU decisions are made behind closed doors by unelected bureaucrats or indirectly by heads of government, ordinary Europeans are alienated from the process (McCormick, 141-149). Despite the best efforts of the EU to address this problem, many observers, especially Eurosceptics, aver that this deficit seems fated to increase (Dinan 2005, 5-6; 286-287; Fröhlich, 28-29).

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<sup>38</sup> A seemingly minor, but possibly noteworthy, shift in nomenclature takes place in this section. Most (if not all) of the authors who estimate migration potential for CEE nationals describe them as “population migration potential” models rather than worker or labor migration potential models. The unstated inherent assumption here is that CEE country citizens are not going to leave for the EU15 member states unless they are departing to take a job. After all, what motivates these researchers (as well as the current research) is the need to estimate how CEE accession might affect the labor markets and politics of the EU15 countries. Based on the EU’s experience with the effects of southern expansion and the EU’s strong bias towards viewing its citizens solely as workers, making the mental note that “population” really stands for “labor” seems like a reasonable strategic assumption to make.

<sup>39</sup> For an influential summary of how economists attempt to model labor migration, please consult Barro and Sala-i-Martin (1995, 285-308). A brief discussion of the empirical literature on migration more broadly can be located in Bauer and Zimmermann (1999, 22-30).

<sup>40</sup> Several excellent reviews, listings and summaries of these estimates now exist (Zaiceva, 6-11; Salt et. al., 83-93; Bijak et. al., 132; Hárs et. al. 2004, 276-278), some of which cover the non-English language literature thoroughly as well. Table 2.1, found at the end of this chapter, contains a summary of relevant information concerning many of the studies cited in this literature review.

<sup>41</sup> Bauer and Zimmermann (1999, 37, 41-43) also describe labor mobility projections based on demographic and economic trends (see Zimmermann [1995] and Coleman [1993]), especially the age cohort and skill differences present between Western and Central or Eastern European economies. However, it seems as though this set of projections could be subsumed under the extrapolation models idea without abusing the latter. It should be noted that Coleman (1993, 538-539) envisages only limited opportunities for mass labor migration from CEE to Western Europe based on the age and skill differences between them.

<sup>42</sup> Although Cold War politics and the construction of the Iron Curtain prevented regularized east-west migration (especially labor migration) between 1948 and 1989, these obstacles did not prevent all migration. Political upheaval in Hungary, Poland, and Czechoslovakia at different times during this era sent millions of CEE migrants streaming westward, for instance. Yugoslavia, which was not quite behind the Iron Curtain, also sent many workers to Western European countries like Germany and Switzerland (Wallace and Stola, 14; Fassmann and Hintermann 1998, 60).

<sup>43</sup> According to Eurostat, the approximate total population of the CEEC10 accession states on January 1, 2001, roughly the midpoint of when these studies were conducted, was 102 million people (Krieger, 18).

<sup>44</sup> In addition, if one presumes, like Boeri and Brücker (2000, a) do in their report, that only 35 percent of the people who comprise this migrant total are present employees, the effect on the EU15 labor markets does not appear to be nearly as substantial as many people might believe. However, a much higher percentage of the immediate post-accession migration flow were employed workers, especially in the UK (Pollard et. al., 27; Brücker and Damelang, 34-37). This fact, along with the EU’s historic focus on securing the free movement of labor, helps to explain why the present analysis rhetorically equates CEEC10 migrants with workers.

<sup>45</sup> In 1998, the next most popular destination (Austria) attracted about twelve percent of the total CEE migrants to come to the EU15 countries (Boeri and Brücker 2000, 126). In fact, Orłowski et. al. (2000) project that CEEC10 worker migration into Austria in the first decade after accession would add up to about two to four percent of Austria’s total population, a considerable figure for that country in that time span (Zaiceva, 8).

<sup>46</sup> In one scenario, the German migrant share is as low as twelve percent (Alvarez-Plata et. al., 56).

<sup>47</sup> Another estimate of CEE migration potential based on the EU’s experiences with expansion in the 1980s concludes that while three to four percent of the CEEC8 region’s gross population will shift locations west

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in the first fifteen years after their accession, only about 1.5 to 2 percent of their net population will do so (Straubhaar 2001, 7). A further forecast of CEE migration based on the free mobility of Greek, Spanish and Portuguese workers in the EU determined that between three and five percent of the CEE's population could be expected to move to the EU15 labor markets (Zaiceva, 13-16). Although that figure might seem a bit high to be included in the consensus model section, the author demonstrates visually (Zaiceva, 31) that her estimates are indeed in accordance with the consensus figures.

<sup>48</sup> Bauer and Zimmermann (1999, 36-37, 97-100) also conduct a survey of migration policy experts in the CEEC10 and determine that their average expectation of population movement falls within the two to four percent range of consensus migration rate (2.65 percent). However, this survey has a very low response rate (20 of 446 experts replied, for a response rate of 4.48 percent), so its results should be utilized with caution.

<sup>49</sup> Krieger (2004, 17-18) also predicts that about a million (0.99 to 1.1 million) CEEC residents should migrate within the first five years of accession (his "firm intention" group). Although this division of migrants into general inclination, basic intention and firm intention bands recalls Fassmann and Hintermann's (1998, 62) separation of their respondents into general, probable and real migration potential groupings, the purposes to which these figures are being put is somewhat different.

<sup>50</sup> One of these unique limitations is that Krieger's (2004, 18) survey does not allow him to predict the destination countries where these migrants would go to find work.

<sup>51</sup> Fertig and a co-author approach the question of Central and Eastern European migration potential somewhat differently in a contemporaneous paper (Fertig and Schmidt). In this work, the authors use historical immigration data from seventeen European and North American countries over nearly forty years to estimate determinant coefficients of migration. These coefficients are then utilized to project migration potentials from four CEE countries (Poland, Hungary, Czech Republic, Estonia) to Germany over twenty years. Not surprisingly given Fertig's other findings, these results demonstrate that the public disquiet over CEE population mobility is probably excessive (Fertig and Schmidt, 20-25). However, as Alvarez-Plata and her co-authors (2003, 27) discuss, if one extrapolates the highest estimate from these results for the entire CEEC10 over a comparable time period, one would discover that Fertig and Schmidt's projections would equal roughly two-thirds of what Boeri and Brücker (2000) predict. That figure would put Fertig and Schmidt's conclusions somewhere at the low end of the two to four percent consensus discussed earlier.

<sup>52</sup> Please note that this potential is not just to the EU15 member states but to anywhere outside of the respondents' home countries. However, since only about six percent of respondents (and no one from the Czech Republic or Slovakia) volunteered a destination country outside of Western Europe, one could argue that these authors' results can be properly compared to those of the other studies in this literature review (Fassmann and Hintermann 1998, 67). In fact, these findings may even make the authors' contention of a small EU15 migration potential even stronger because of the possibility of migrants leaving for places other than the EU.

<sup>53</sup> One piece even suggested that, including Russia, around one hundred million people from this part of the world would emigrate to Western Europe (Coleman 1993, 524).

<sup>54</sup> Alecke et. al. (2001, 64) briefly discuss a number of these higher-end estimates, including the notion that fifty million CEE migrants might soon be moving to Western Europe. Most notably, they describe an early estimate by Franzmeyer and Brücker (1997, 89, ft. 2) that states that up to 680,000 people, or about 0.5 to 1.0 percent of each sender countries' population (Zaiceva, 7-8), could emigrate from the Central European Free Trade Area (CEFTA) countries (Poland, Hungary, Czech Republic, Slovakia, Slovenia) annually until 2030. That would translate to nearly 1.2 million people per year from the entire CEEC10 for the next several decades.

<sup>55</sup> It should be noted that Sinn and his co-authors (2001, xvi-xvii) only run projections for the five of the CEEC10 economies that had the largest populations (Poland, Romania, Hungary, Czech Republic and Slovakia) and then extrapolate to acquire the CEEC10 figure.

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<sup>56</sup> In particular, Flaig (2001, 74, 76) determines that more than three million people from five CEE countries (Poland, Hungary, Romania, Czech Republic, Slovakia) would arrive in Germany within fifteen years after EU accession. If one were to extrapolate these numbers for the rest of the CEEC10 as Sinn et. al. (2001) does, then one would arrive at figures that are close to those of Sinn et. al.'s article.

<sup>57</sup> In discussing cross-border commuting, especially in Central and Eastern Europe, one should probably take care to make a distinction between the “false tourists” who embark on many short-term trips from their homes every year to purchase goods that can then be sold at a profit in their home economies and people who live in one country but work in another and cross the border on a daily basis to travel to and from their workplaces (Stola 2001, 94-102; Hárs et. al. 2001, 256-257, ft. 5; Okólski, 110-124). The former can locate their origins in the Cold War-era Polish “suitcase traders” who would take advantage of the price differences in the COMECON (Council for Mutual Economic Assistance) economies and their own country’s relatively lax visa policies for visiting fellow Eastern-bloc countries to earn a little extra money during the lean years of Communist rule. Once the CEE countries relaxed their mobility restrictions after the Cold War ended, small-scale traders from all of these states became a common sight at the region’s border crossings, train stations, and peddler’s markets. In fact, these open-air markets became known as “comecon markets” in a nod to their origins (Czakó and Sik, 715-716; Sik and Wallace, 697-698, 706; Stola 2001, 94-98; Wallace 2002, 613). Although these small-scale traders are an important part of the CEE’s incomplete circular migration pattern (Okólski, 106-107) discussed elsewhere in this literature review, the more traditional cross-border commuters who shuttle to and from home and work in different countries are the focus of this discussion. Cross-border commuting has a long history in the EU; for instance, a 1964 Council directive on the free mobility of workers specifically exempted cross-border commuters (or “frontier workers” in EU parlance) from a rule that allowed member states to suspend that right in cases of domestic labor-market instabilities (Maas, 20, 66). This activity has been especially popular in certain areas of the EU, such as in the Benelux countries and along the border between France and Germany (Huber and Nowotny, 34-39; Recchi, 69-70). However, although there are many case studies (Greve and Rydbjerg; Gottholmseder and Theurl) of cross-border commuting in particular European regions such as the Cross-Border Commuting in the EU: Obstacles and Barriers (CROBOCOB) project (Clasen, cited in Recchi, 70; Ruppenthal et. al.) that examines six different such areas, Huber and Nowotny (2009, 31) claim that no study has thus far attempted to investigate this phenomenon on a Europe-wide level. Their effort in this direction employs EU Labor Force Survey data and determines that cross-border commuting is a relatively rare activity for EU workers, as only 0.6 percent of them report engaging in it between 2005 and 2006 (Huber and Nowotny, 34). Even this low figure might be somewhat misleading, however, as the majority of border regions report that less than 0.5 percent of their workers engage in cross-border commuting (Huber and Nowotny, 35-36). The overall average could be inflated because there are several “hot spot” regions that possess conditions that make it considerably easier for workers to commute across their borders, such as a shared language or long history of such travel. These areas include the Czech Republic-Slovakia border, the Alsace-Lorraine region of France, the Vorarlberg *Land* in Austria, and the entire country of Luxembourg (Huber and Nowotny, 34-41; Gottholmseder and Theurl, 97-101). Huber and Nowotny also perform a regression analysis to discover the determinants of commuting in which they find that shorter distances, language similarities, and greater economic differences are consistent, positive predictors of this behavior. Additionally, these authors contend that the results of their model bring into question the idea that the end of the labor migration derogation for the CEEC10 workers would unleash a deluge of such commuters to the EU despite forecasts to the contrary (Huber and Nowotny, 44-48; Maas, 81). In other words, these results agree with the predictions of more “permanent” CEEC10 net worker migration that argue that only a modest increase in their numbers should have been expected by the post-accession EU15 governments.

<sup>58</sup> Please note that the following abbreviations are used in this column for the sake of saving space: BU--Bulgaria; CZ--Czech Republic; ES--Estonia; HU--Hungary; PO--Poland; RO--Romania; SK--Slovakia; SV--Slovenia. Additionally, “percent” in the Estimated Migration Flow column always refers to the percentage of the sender-countries’ total population, not the target region’s; in pieces where several forecasts are reported, the medium or baseline projection data are recorded in that column as well.

### Chapter 3: Statistical Models

For the millions of EU workers who labor in member states other than the ones in which they were born and hold citizenship, the fact and effects of their presence in these “foreign” economies are well-established in the popular and academic<sup>1</sup> literature. These workers provide necessary skills for, and occupy positions that are difficult to fill within, the host country and the companies that hire them. Most of these workers go about their duties quietly and cause very few problems for their host countries’ political systems. However, as has already been noted, the presence (or even the threat of the presence) of Central and Eastern European new member-state workers created considerable consternation among many EU politicians and their publics. For these individuals and political communities, the operative questions then become the incentives for these new member-state workers to pick up stakes and move to the older members’ economies and, based on the magnitudes of those motivations, how many CEEC10 workers will take that step in the long-term future. It is these matters that the following empirical research endeavors to address, starting with an explicit description of the research hypotheses and expected relationships that lie behind the statistical model that is constructed, modified and employed here. This model is also operationalized in the first part of this chapter, including a depiction of the data sources that provide the raw materials for this study. The results of the various specifications of the main model are then presented and analyzed to determine whether the initial expectations of the research hypotheses are satisfied. This step includes an investigation of the projections of CEEC10 labor migration to the EU15 countries on the broader question of whether older member-states’ worries about this phenomenon are justified and reasonable. Finally, the concluding paragraphs of this

chapter appraise the augmented state of the literature's collective knowledge of intra-EU labor migration, especially that between poorer and wealthier member states. This section includes a concise case study of concerns about "welfare shopping" in the EU, especially as it deals with the migration relationship between Poland and the United Kingdom, in an attempt to provide some detailed context for the migration numbers forecast by the main model.

### **Hypotheses and Operationalizations:**

It is still a relatively rare occurrence for social scientists to explicate their relationships of interest in explicit hypothesis statements. More often, these expectations are camouflaged by the descriptions of their models or are assumed without much detailed exposition of their origins; a good example of this practice is how Fertig (2001, 709-711) develops his model that is the inspiration for many of the ideas and methods utilized by the present study. Although they might seem a bit cumbersome, this analysis has decided to adopt the stance that overt hypothesis statements are a useful tool for the reader to comprehend exactly what is under discussion and for the author to be as transparent as possible about the assumptions present in this investigation.

*Dependent Variable*--However, before introducing the first such hypothesis statement, it is necessary to describe the operationalization of the dependent variable for the statistical models, change in net migration rate ( $\Delta mr_i$ ). The net migration rate is calculated by taking the difference between the population inflows from and outflows to each migrant-donor country<sup>2</sup> and Germany during the year in question (1960 to 2003) and then dividing that figure by the population of the sender country (Hatton, 411). Although it has been stated previously, it bears repeating that net rather than gross (Zaiceva, 13)

migration is utilized here because the former concept represents the more politically salient permanent migration, is cited more commonly in the literature, and is less likely to overstate the magnitude of the effects of labor migration on the receiver country.

Additionally, any forecast of medium to long-term labor migration, the subject of this research, should concern itself with net rather than gross migration because the size of the flow of the net migration stream could strongly impact the likelihood and magnitude of permanent migration from one place to another (Fertig, 712). The change in net migration rate rather than the net migration rate itself is utilized as the dependent variable since that step follows the example of some important parts of this literature (Fertig; Boeri and Brücker 2000), permits this model to examine (with the addition of level and change in level independent variables) both the short and long-run determinants of labor migration, and allows for acceptable forecasts of future intra-EU labor migration (Boeri and Brücker 2000, 116). The migration rate rather than per capita migrant stock is employed as part of the dependent variable because although both the speed with which migrants are entering a receiver country's labor market and their total numbers there matter politically, a high arrival rate seems to engender a greater political response than a large, but static, migrant population. In addition, most of the relevant studies<sup>3</sup> in this field (e.g., Hatton; Zaiceva; Fertig; Fertig and Schmidt; Alvarez-Plata et. al.) use migration rate rather than migrant stock as their dependent variable and migration rate more directly captures the dynamic nature of the phenomenon under study here. Finally, due to the significant autocorrelation (AR(1) process) that is present in data from previous studies employing different forms of the dependent variable (Hatton, 412; Boeri and Brücker 2000, 116; Fertig, 713), a one-year lag of the net migration rate is included in the models under investigation.

*Hypotheses*--Since the economic determinants of migration play such a critical role in previous studies of this activity, it is appropriate that the hypotheses related to these factors are examined first by this discussion.

*Hypothesis 1*--Differences in economic conditions between migrant recipient and sender countries impel poorer-state workers to leave home and take jobs in more prosperous states.

*Hypothesis 1a*--The greater the discrepancy is in average wage rates between two countries, the more workers will migrate from the low wage region to the high wage one.

*Hypothesis 1b*--The larger the unemployment rate is in a potential migrant-donor country, the more workers will leave the area of high unemployment; the larger the unemployment rate is in a potential receiver country, the fewer worker migrants will be attracted to that economy.

This collection of hypotheses and variables is derived directly from micro-level neo-classical economic theories of migration and follows in the tradition of Hatton's (1995), Sjaastad's (1962), and Harris and Todaro's (1970) work. The general notion here is to capture the wage gains achieved by workers who shift economies, adjusted by their chances of finding a job in the recipient country. Those wage rate gains are operationalized as the change in the ratio of the receiver-country's average wage to that of the sender country in each year of the study. Changes in the level of this independent variable are again employed here rather than the levels themselves so this model can examine both short and long-run determinants of the migration rate. Additionally, a one-year lag of the wage ratio variable is included in these models to examine whether this regressor persistently impacts changes in the migration rate. One should anticipate a positive relationship between changes in the wage rate ratio (and the lagged wage rate ratio) and changes in migration rates because rational workers are expected to maximize their earnings whenever possible, subject to the costs of moving and other economic, political and social barriers<sup>4</sup> that make it difficult to fully engage in that wage

maximization process. Unfortunately, comprehensive and comparable wage rate data across many countries are not available for any substantial length of time, so this research follows the example set by several other works in this field and utilizes the natural log<sup>5</sup> of Maddison's (2003) purchasing power parity per-capita GDP data (1990 international Geary-Khamis dollars) as a proxy for income instead. By no means is this substitution a perfect one because employment rate and population issues are folded into this "income" information, but these data are the best-available approximation of wage figures in the literature (Fertig, 712; Boeri and Brücker 2000, 114, 153-154). In addition, the underlying purpose of including this independent variable in the analysis is to estimate what sorts of economic gains induce workers to move from one country to another. Although per-capita GDP is not a flawless substitute for wages, especially since many migrants earn less than the average wage in the host economy, it can stand in for wages if one is interested in the changes of economic rewards that migrants could expect by altering their places of employment.

Just as with utilizing per-capita GDP data for wages above, a minor substitution for the unemployment statistics is also performed here in that employment figures (defined as one hundred minus each country's unemployment percentage) are used instead of the raw unemployment data. There are both pragmatic and stylistic reasons for this decision; from the former viewpoint, using employment rather than unemployment figures avoids the problem of taking the natural log (ln) of the null unemployment rates reported by a few countries at certain points in the relevant time series. In the case of the latter perspective, making use of employment rather than unemployment figures transforms the expected relationships into a more intuitive structure. Specifically, an

increase in the employment rate of the host country should make it more attractive to labor migrants, which should increase the rate at which they flow to that recipient state. Conversely, an increase in the employment rate of the donor economy should reduce the flow of workers out of that economy and make it more attractive to returning migrant workers, thus reducing the overall outmigration rate. As with the GDP ratio data described above and for identical reasons, both the change in the sender and receiver-country's employment rates and a lag of each rate are included in these models. There seem to be some differences in the literature<sup>6</sup> over whether including both sender and receiver-country employment as separate variables or putting them in their models as a ratio of receiver to sender-country unemployment is more appropriate. From an ease of calculation perspective, especially for the projections, it might be advisable to insert both employment variables separately. However, for the sake of consistency with the GDP ratio's operationalization and for expository reasons (a ratio better expresses the notion that sender-country workers improve their chances of finding jobs by moving to the receiver economies), this option might be the better alternative. Since the consensus on this point in the literature appears to be unstable, models with both the two employment variables treated separately and a ratio are created here to determine if there is much difference between their results and utility. As the logic of the GDP ratio variable's relationship to the dependent variable would dictate, one would expect that the receiver to sender-country employment ratio should also have a positive relationship with migration rate since the improved odds of finding a job in the host economy over the sender one should attract rational migrant workers to the receiver country.

*Hypothesis 2*--The presence of a history of migration from one country to another makes it more likely that current worker migrants will continue that pattern.

This conjecture is a direct outgrowth of the historical-structural idea called network theory, which asserts that economic migrants create webs of interpersonal relationships that make it easier and less expensive for later migrants from the same places to take similar journeys. The social capital that is invested in these relationships reduces the risks and costs for later migrants in terms of finding a job, housing, and social services. In fact, once a critical mass of migrants is reached, inertia takes over and this pattern of worker movement becomes self-perpetuating (Massey et. al. 1993, 448-450; Massey et. al. 1998, 42-45). This idea is operationalized here as the stock of sender-country migrants living in Germany during the year in question divided by that donor-country's population. These stock data are divided by the population figures<sup>7</sup> of the appropriate countries because if network theory is accurate, the greater the concentration of a sender-country's population in one place, the more interconnected should be the webs of "friends and family" present in that country and the more that they should influence the decisions of other labor migrants to move there. Overall, one should expect based on network theory that the greater the concentration of a sender-country's migrants in a receiver country, the higher the migration rate from that donor country to the host should also be. In contrast to how the economic variables are operationalized, the first-order lag of migration stock<sup>8</sup> is not used here; rather, the level variable is employed instead. This step is taken because the current level of migration stock should influence migrants' decisions about moving to a new economy, not last year's stock amount. This migration stock represents the result of many years' worth of migration, and it is that accumulation of people over the decades that influences later workers to shift to the new economy. It should be noted that at least two past analyses in this literature come to quite

different conclusions about the effect that a country's migrant stock has on the migration rate from that place. Fertig (2001, 15) determines that this stock has a negative effect on labor mobility from the country of interest, a result that he attributes to a crowding-out effect (earlier migrants take job opportunities away from potential later ones and thus discourage them from leaving home). Zaiceva (2006, 14), however, discovers a positive relationship between the extent of migrant networks and migration flows from the sender to the receiver country. In short, the difference between what this analysis predicts and what at least some authors find acts as an extra motivation for the current work.

*Hypothesis 3*--Countries that have a greater ability to absorb foreign workers into their economies are more likely to attract those workers than countries that cannot do so.

The genesis of this hypothesis lies in both neo-classical economic and dual labor market (another of the historical-structural perspectives described in the literature review) theories. An economy with a large number of unfilled jobs, the way in which this variable is operationalized here (the number of host-country vacant positions in each year divided by that country's civilian labor force), is naturally attractive to a migrating labor force as it is an indication that a need for foreign labor exists in that potential host economy. However, the presence of these job openings is not only a suggestion to prospective migrants that work is available in the receiver economy, it could also be a signal that this economy is not producing the "right" kinds of workers to staff all of its needed positions. As dual labor market theory asserts, when an economy reaches a higher level of development, certain jobs become unsuitable for even the most desperate host-country workers to take. Nonetheless, these jobs must be performed no matter how distasteful<sup>9</sup> they are to the receiver-country workers, so the companies involved in providing these services must turn to foreign labor to execute these tasks. In short, the inclusion of both

employment rates and what this research calls absorption capacity<sup>10</sup> is describing related but not identical push-pull determinants of labor migration. Generally, one would expect that an increase in this absorption capacity leads to a corresponding increase in the net rate at which migrants arrive in that host<sup>11</sup> economy. Just as with the other economic variables described in the discussion of Hypothesis 1 and for the same reasons, both the change in absorption capacity from year to year and a one-year lag of the level of that capacity are utilized in the statistical models. This decision also provides a degree of continuity of treatment for all of the economic independent variables in this analysis.

*Hypothesis 4--* Political conditions in, and policy choices made by political actors in, sender and receiver countries affect the rate at which migrants enter the receiver-country economy.

*Hypothesis 4a--* The presence of a policy of free worker mobility between two countries makes it more likely that workers will move from the state with the weaker economy to the state with the more prosperous one.

*Hypothesis 4b--* The adoption of a government-sponsored guest worker program between two countries accelerates the net migration rate between them from the host-country's perspective.

*Hypothesis 4c--* Host-country governments that subsidize foreign worker repatriation programs will experience decreases in their net migration rates.

*Hypothesis 4d--* The existence of political turmoil in migrant-donor countries, including wars and coups, promotes higher net migration rates to host-country economies.

*Hypothesis 4e--* Regime differences, particularly those between authoritarian sender countries and democratic receiver states, encourage greater rates of net labor migration from the host country's point of view.

Although this fourth main hypothesis does not seem like it should be very controversial, as has already been demonstrated several theories and observers of migration have brought into question the utility of political attempts to control labor migration. For instance, Boeri and Brücker (2000, 119) find that the expiration of the free movement derogation for the Southern European EU member states had little effect on the flow of Spanish, Portuguese and Greek workers to the wealthier EU countries, and the

European Commission (2006, 14) argues that the transitional arrangements for the CEEC8 member states only delay labor market adjustments between EU countries. Additionally, economic theories of migration contend that this phenomenon does not stop until the underlying (economic) causes of migration behavior have been addressed. Network and cumulative causation theories also maintain that once migration patterns are established, it is extremely difficult for governments to alter them.

Each of these five political and policy-related hypotheses are operationalized through the use of dummy variables, just as studies of migration have done previously (e.g., Boeri and Brücker 2000; Fertig; Zaiceva). The first dichotomous independent variable, the one for free mobility of workers, is defined as a one if free movement existed between Germany and that donor country for the year in question and a zero otherwise. That definition implies that this variable is a one for the following countries from the relevant years to the present day: the remaining EEC6 countries, 1968; the UK, Ireland and Denmark, 1973; Greece, 1989; Spain and Portugal, 1992; Austria, Finland and Sweden, 1994 (Biffel, 156; McCormick, 140, 158; Hailbronner, 30-32). The guest worker program dummy is operationalized similarly to the one for free mobility; it is coded as a one if a recruitment treaty was in force between Germany and the country in question during that year and as a zero in all other cases. Based on the information provided by Bauer et. al. (2005, 206) and Meyers (2004, 127), this variable is a one for only the following states and years: Greece, 1960-1973; Italy, 1960-1973; Portugal, 1964-1973; Spain, 1960-1973; Turkey, 1961-1973; Yugoslavia, 1968-1973. A converse policy to worker recruitment, one of actively repatriating foreign workers and their families to their countries of origin, was pursued by the German government three times

during the time period of interest: for a total of eight months in 1983 and 1984 for all former beneficiaries of the *Gastarbeiter* programs; in 1996 and 1997 for refugees from the Yugoslav civil wars; and in 1999 and 2000 for refugees from the Kosovo conflict (Bauer et. al., 214-215; Meyers, 132-133, 136-137). That fact implies that this dummy variable is coded as a one only in 1983 and 1984 for the six countries that once had worker recruitment treaties with Germany, and in 1996, 1997, 1999 and 2000 for Yugoslavia (which by this point consisted of only Serbia and Montenegro).

The fourth dichotomous variable utilized in this study is the one for sender-country political instability, which is included in this analysis upon the assumption that wars, coups and other national political problems produce migrant flows to safer countries. Boeri and Brücker (2000, 120, 154) report that the inclusion in their models of Yugoslav data from the 1990s has some effect on their coefficients but an overall negligible impact on their projections. However, this research broadens Boeri and Brücker's notion of political instability to include coups and other incidents of sudden regime transition in the country in question and has determined that it is worthwhile to include this more extensive operationalization in its analysis out of an abundance of caution about the results. That fact implies that this variable is coded as a one not just for Yugoslavia during the war years (1991-1995, 1999) but also for Greece (1967, 1974), Portugal (1974), and Turkey (1960, 1971, 1980) as well. The final political dummy variable concerns how regime differences affect migration flows, and presumes that workers are often pushed out of authoritarian regimes to democratic ones for economic and political reasons. Since the receiver country (Germany) was a democracy during the entire time under examination here, the question then becomes how to operationalize

what an authoritarian regime is for this study. For the purposes of this research, an authoritarian regime is one that can be labeled as “partly free” or “not free” as defined by the combined score of the civil liberties and political rights scales presented in Freedom House’s<sup>12</sup> well-respected annual publication *Freedom in the World*. This definition means that this variable is scored as a one for each of the following countries and sets of years: Greece (1967-1973); Portugal (1960-1975); Spain (1960-1976); Turkey (1960-1961, 1971-1973, 1980-2003); and Yugoslavia (1960-2001).

The only remaining independent variable operationalizations are the ones for the fixed-effects variables employed by this study. Fixed-effects variables are utilized for values that either do not change or shift very slowly over the course of the time period of interest (Zaiceva, 14). These relationships pose special challenges for a time-series analysis such as this one because independent variables must vary in order to avoid serious statistical complications (and if this concept is to be at all meaningful). However, since these variables do have different values across the countries in the panel (i.e., they vary cross-sectionally if not chronologically), they can be included in a limited way in this analysis without creating grave statistical difficulties.

*Hypothesis 5*--Time-invariant, or limited time-variant, factors can play important roles in determining the net migration rates between countries.

*Hypothesis 5a*--As the quality of life (level of development) improves in migrant-sender countries, the less likely it is that workers will move from a donor to a receiver economy.

*Hypothesis 5b*--Language similarities between migrant host and donor countries increase the likelihood that sender-country workers will take jobs in the host country.

*Hypothesis 5c*--The further that workers must travel to take jobs in other countries, the less likely it is that they will undertake that journey.

*Hypothesis 5d*--Migrant-sender and receiver countries that share a border with one another are more likely to have high net migration rates between them than similar pairs of countries that do not share a border.

*Hypothesis 5e*--The presence of a global city in a migrant-sender country reduces the likelihood that workers will cross a state border to start work in another country.

The initial country-specific time-invariant independent variable of interest here is the one dealing with the level of development<sup>13</sup> of the migrant-sender countries. This variable is operationalized as the 2003 value for the Human Development Index (HDI) score<sup>14</sup> of each country (United Nations 2008, 25-26). The higher the level of this index, the better the quality of life is in that country (and thus the lower the chances are that workers from that country will be induced to take jobs in other states). The HDI is a measure of well-being of most UN members' citizens that takes into account not just standard of living (as the economic variables described above do) but literacy, education and health matters as well (United Nations 2008, 355-356). The variety of information sources and the multiple measures of quality of life that the HDI employs implies that it can be included in this analysis without generating serious multicollinearity problems. As Boeri and Brücker (2000, 154) assert, the relative HDI ranking<sup>15</sup> of the countries in their analysis is fairly steady over the time period of concern. Therefore, even though states' relative HDI positions may change somewhat over time, they do not do so enough to prevent their use as part of the fixed-effects estimators. The adoption of this presumption is reasonable given its use in this way not only in Boeri and Brücker's (2000) analysis but also in Fertig's (2001) and Zaiceva's (2006) as well. The effort that migrants must expend to overcome language differences between their country and that of their host economy is one part of the obstacles to worker mobility that Sjaastad (1962, 84-85) refers to as the "non-money" mental costs of migration. It thus stands to reason that language similarities between countries should make it easier for sender-country workers to take jobs in a host economy and thereby increase the net migration rate between them, which is exactly what Boeri and Brücker (2000, 120-121) determine in their analysis. Three

countries in the current sample (Austria, Luxembourg and Switzerland) use German as their sole official language or as one of their official languages and are thus coded as a one for this variable.

The next two country-specific variables are closely related to each other but, as shall be seen momentarily, are not identical in their theoretical implications. Gravity models of migration (Ravenstein, 1885, 1889) posit that a person's propensity to migrate decreases with increasing distance between their home and destination. This explanation is not a behavioral one and has thus been downgraded in importance in recent migration models, but it can still be included in a larger model such as the present one as a descriptive variable. Zaiceva (2006, 14, 28) and Boeri and Brücker (2000, 120) come to different conclusions about the utility of this variable, so it is even more important to include it here in order to determine which author is more likely to be correct about their inferences on this point. This variable is operationalized as the air distance in kilometers between the capital city of the donor country and Frankfurt am Main, a major German economic hub<sup>16</sup>. Even though the hypothesis that avers that neighboring states should have a greater migration rate between them than those that do not share a border might seem like a variant of the gravitational model described above (with a distance of near zero for migrants who live and work right along the border), matters are somewhat more complex than that. Border areas often share historical, linguistic and cultural similarities that make migration within them seem easier<sup>17</sup> than even moving one hundred kilometers within one's own country to a place that does not have these connections. Therefore, both the distance between capitals variable formulated above and a dummy variable for having a border with Germany are included in this analysis. Due to the very real possibility of

multicollinearity here, however, regressions with and without either and both of these variables are performed and checks are made for the presence of this issue. The final time-invariant independent variable of interest here involves the presence of a “global city” in the country of migration origin. The global city concept comes from the historical-structural school of thought known as world systems theory (Massey et. al. 1998, 40-41). This theory suggests that much of the globe’s economic activity has become concentrated in only a few cities that attract large quantities of skilled and unskilled labor. The presence of one of these metropolises in a migrant-sender country reduces the migration rate to other economies because the global city serves as a magnet to migrant workers of all stripes and thus limits the need for cross-border migration. Since global cities do not develop rapidly and there is considerable inertia in their status once they are established, this variable can be considered as time-invariant even though they may change somewhat over the years. The operationalization of this variable is provided by Friedmann (1986, 72), who has a list of primary<sup>18</sup> core-country global cities that serves as this research’s list of such world centers of commerce and industry. The inclusion of this variable appears to be unique to this research, and should therefore be a valuable addition to the literature on the question of migration determinants.

#### **Data, Methods and Procedures, and Model Construction:**

Although the political and fixed-effects variables are operationalized and their data sources are provided above, the origins of the other variables’ data are not described there because they are somewhat more involved than the ones that have already been discussed. The net migration data for the dependent variable in this analysis, the annual change in net migration rate for each of the twenty-two donor countries to Germany, are

obtainable from the German Federal Statistical Office (*Statistisches Bundesamt*) for all of the years<sup>19</sup> of interest. It should be noted (Fertig, 712) that the Statistical Office excludes returning ethnic-German migrants (*Aussiedler*) from these counts. The population data<sup>20</sup> that are necessary for the denominator of the dependent variable's operationalization are found in multiple issues of the United Nations' annual *Demographic Yearbook*, as is a fairly common practice in these studies (e.g., Fertig and Schmidt, 20). The bulk of the migrant stock data<sup>21</sup> (1967 to 2003) is also available from the German Federal Statistical Office, but not all<sup>22</sup> of those figures can be found there. These data must be supplemented by migrant stock data located in the 1961 German national census and then interpolated to provide figures for the years 1962 to 1966. Interpolation is not always the most accurate strategy to employ in these cases, but the steady increases in migrant stock noted for most of the sender countries for a few years after 1967 give comfort that it should not adversely affect this study's results.

The economic data that form the basis of a large portion of this analysis are available from a variety of sources. As indicated earlier, the per capita GDP (wage level proxy) figures are derived predominantly<sup>23</sup> from Maddison (2003), just as in many other previous studies of this question. Finding consistent unemployment data for all of the countries in this study is somewhat more difficult due to the different standards that national statistical agencies utilize for this figure. However, OECD (2008) has a data set that covers virtually all twenty-two countries and that conforms to International Labor Organization (ILO) standards for this figure. Just as Boeri and Brücker (2000, 154) and Fertig (2001, 712) must, however, these unemployment figures are supplemented by national statistical office figures and other sources<sup>24</sup> where necessary. The OECD (2008)

labor force statistics database referred to earlier also grants the civilian labor force figures required to calculate the absorption capacity variable. The German unfilled job vacancies information needed to complete that variable is also provided by an OECD database, but these data are from their Main Economic Indicators<sup>25</sup> source instead. Table 3.1 provides some summary descriptive statistics for the dependent variable and the most important independent variables in this analysis.

*Methods*--The procedures by which the forecasts of CEEC10 labor migration are calculated here are somewhat complex, but this section attempts to explicate these steps as clearly as possible. First, the overall model, including all of the variables described above and using the data from 1960 to 2003, is analyzed with twenty-two dummy variables<sup>26</sup> (one for each country-specific fixed effect) added to it (Allison, 9, 21-23). This regression employs the FGLS technique because of the groupwise heteroscedasticity that is present<sup>27</sup> in these panel data (Baltagi 2008, 87-91; Baltagi 2009, 99, 133; White); the data's autocorrelation is accounted for by the inclusion of the lagged dependent variable. The coefficients for these dichotomous variables become the data for the dependent variable in a separate OLS regression<sup>28</sup> with the fixed-effects independent variables listed in the discussion of Hypothesis 5. The fixed-effects variables that are significant predictors of the countries' dummy coefficient values then replace the country-specific fixed-effects coefficients in the migration projection models. These forecast models employ the long-term (steady-state) coefficients of the independent variables of interest, which are calculated by dividing the non-change in level coefficients by the one for lagged migration rate (see below for the equation that demonstrates this process). This step is appropriate since this analysis is interested in utilizing the steady-

Table 3.1: Descriptive Statistics for Selected Variables in All-Country GLS Regressions

Variable Name	Mean	Standard Deviation
Net Migration Rate	0.00019	0.00107
Ln (GDP Ratio)	0.12774	0.44919
Ln (German Employment)	4.55655	0.03320
Ln (Donor-Country Employment)	4.54348	0.04841
Per Capita Migrant Stock	0.00719	0.00990
Absorption Capacity	0.01273	0.00705
Free Movement Dummy	0.36	0.481
HDI	0.93098	0.04630

state determinants of migration and this action eliminates short-term migration determinants from the projection equation. The projected rates of migration to Germany from the CEEC10 member states can then be calculated for each of these new EU member states using the relevant data points for 2003 and particular assumptions about economic convergence, employment and other economic and political factors. The standard figures for these forecasts have been assumptions of a two-percent rate of economic convergence and no change in the employment difference, but as shall be seen below many different scenarios can be validly explored here. At this stage of the process, the migrant population numbers for each country can be computed given each year's rate and that country's 2003 population<sup>29</sup> figure. Once this task is complete, a migration extrapolation to the entire EU15 can be made given these migration projections to Germany and further assumptions<sup>30</sup> about the distribution of CEE migrants in the EU15 member states (Boeri and Brücker 2000, 116-128; Fertig, 712-718; Zaiceva, 12-15, 32-33).

*Model*--The overall statistical model that is employed in this analysis can be written in extensive form as:

$$\Delta mr_{dt} = \beta_1 \Delta \ln(w_r/w_d)_t + \beta_2 \Delta \ln(e_r)_t + \beta_3 \Delta \ln(e_d)_t + \beta_4 (ms_d)_t + \beta_5 \Delta (ac_r)_t + \beta_6 \ln(w_r/w_d)_{t-1} + \beta_7 \ln(e_r)_{t-1} + \beta_8 \ln(e_d)_{t-1} + \beta_9 (ac_r)_{t-1} + \beta_{10} mr_{dt-1} + \beta_{11} FM_t + \beta_{12} GW_t + \beta_{13} WR_t + \beta_{14} PT_t + \beta_{15} RD_t + \beta_{16} COUNTRY$$

where  $mr_d$  is the migration rate of donor-country residents to the receiver country in year  $t$ ;  $w_r$  and  $w_d$  are the wage (GDP) rates and  $e_r$  and  $e_d$  are the employment rates of the receiver and donor country, respectively;  $ms_d$  represents the migrant stock of the donor country in the receiver country;  $ac_r$  stands for the absorption capacity of the receiver country;  $FM$  refers to whether the host and sender countries had a free movement of

workers deal between them; GW represents whether the two countries in question had a formal guest worker arrangement; WR denotes whether the receiver country had an active worker repatriation program; PT corresponds to whether the donor country was experiencing political troubles (a war or coup, for example); RD signifies whether there was a regime difference between the receiver and donor country during the year in question; and COUNTRY stands for the five country-specific fixed-effects dummy variables described previously. In those models where the ratio of the employment rates are used, the appropriate variables are replaced by  $\Delta \ln(e_r/e_d)_t$  and  $\ln(e_r/e_d)_{t-1}$ . Following Boeri and Brücker (2000, 116) and Fertig (2001, 716-717), the projection models utilize the long-term coefficients of the independent variables of interest, which can be calculated according to the following equation:

$$mr_d^* = (\beta_4/\beta_{10})ms_d + (\beta_6/\beta_{10})\ln(w_r/w_d) + (\beta_7/\beta_{10})\ln(e_r) + (\beta_8/\beta_{10})\ln(e_d) + (\beta_9/\beta_{10})ac_r + (\beta_{11}/\beta_{10})FM + (\beta_{12}/\beta_{10})GW + (\beta_{13}/\beta_{10})WR + (\beta_{14}/\beta_{10})PT + (\beta_{15}/\beta_{10})RD + (\beta_{16}/\beta_{10})COUNTRY$$

where  $mr_d^*$  is the steady-state (long-term) migration rate from the donor country to the receiver country. Due to the expected negative sign of the lagged migration rate variable, this coefficient must be multiplied by a negative one to avoid altering the equilibrium relationships between the other independent variables and the migration rate.

### **Regression Results:**

In general, the outcomes of the full model that utilizes all twenty-two countries' data are in line with what is expected in the hypothesis generation section of this chapter.

However, there are a few serious, and several minor, exceptions to that statement that are explored at length in this section. Table 3.2 contains the outcomes of the complete basic model's analysis and, although most of the relationships appear as predicted, at least two

Table 3.2: Estimation Results for Complete Basic Model

Variable Name	Coefficient	t-value	sig
Change Ln (GDP Ratio)	0.0025690	8.36	0.000
Change Ln (German Employment)	-0.0008386	-0.32	0.750
Change Ln (Donor-Country Employment)	-0.0018582	-3.17	0.002
Per Capita Migrant Stock	-0.0087352	-1.32	0.186
Change Absorption Capacity	0.0585510	9.14	0.000
Lag Ln (GDP Ratio)	-0.0001201	-2.03	0.042
Lag Ln (German Employment)	0.0002347	0.30	0.767
Lag Ln (Donor-Country Employment)	-0.0013142	-4.83	0.000
Lag Absorption Capacity	0.0094848	2.36	0.018
Lag Net Migration Rate	-0.3923536	-14.42	0.000
Free Movement	-0.0000103	-0.62	0.538
Guest Worker	0.0003943	4.02	0.000
Worker Repatriation	-0.0006100	-3.71	0.000
Political Troubles	-0.0002115	-0.91	0.363
Regime Difference	0.0000525	0.72	0.474
Australia	0.0047853	1.28	0.201
Austria	0.0052320	1.38	0.166
Belgium	0.0048161	1.29	0.199
Canada	0.0047379	1.27	0.206
Denmark	0.0048334	1.29	0.197
Finland	0.0048638	1.30	0.194
France	0.0048238	1.29	0.198
Greece	0.0051730	1.36	0.173
Ireland	0.0048945	1.31	0.191
Italy	0.0048080	1.28	0.200
Japan	0.0048958	1.31	0.192
Luxembourg	0.0050642	1.34	0.179
Netherlands	0.0049155	1.31	0.191
Norway	0.0048643	1.30	0.195
Portugal	0.0050033	1.33	0.183
Spain	0.0047412	1.27	0.205
Sweden	0.0048363	1.29	0.197
Switzerland	0.0047991	1.28	0.201
Turkey	0.0052760	1.40	0.162
United Kingdom	0.0048245	1.29	0.198
United States	0.0047522	1.27	0.205
Yugoslavia	0.0054575	1.44	0.149

Dependent variable: change in net migration rate ( $\Delta mr_{dt}$ )

Number of observations: N = 946

Wald  $\chi^2$  (37) = 521.52 (0.0000)

anomalous results are apparent to the reader even during a cursory examination of this information. The first is the null result (in the theoretically unexpected direction) between change in German employment<sup>31</sup> and the dependent variable while absorption capacity has a strongly positive relationship with change in net migration rate. While one would anticipate that a positive relationship would exist between absorption capacity and the dependent variable, it seems strange that this association would be stronger than any other in the model. Unfortunately, the operationalizations of absorption capacity and German employment are essentially measuring the same aspect of the German economy, so these two independent variables are highly correlated (Pearson's  $r = .608$ ) with one another. Since nearly all past statistical investigations of the determinants of migration flows use receiver-country employment as a factor and multicollinearity has a significant presence here, the absorption capacity variable<sup>32</sup> is dropped from this analysis. This action permits the theoretically expected strong positive relationship between changes in German employment and net migration to manifest itself (results not shown). However, there remains the issue of the Political Troubles independent variable's unanticipated and weak association with the dependent variable. A thorough investigation of this outcome discovers that this observation is the result of a coding abnormality in Political Troubles. In other words, the years in which coups occurred in Greece, Portugal and Turkey just happened to be years of considerable economic distress in Germany and thus times when substantial return migration to these sender countries took place (for instance, see Rose, 134-135). If one limits the definition of this political instability variable to periods of open military conflict as Boeri and Brücker (2000, 154) do, which in this case would mean coding this new "War Only" variable as a one for Yugoslavia between 1991 and

1995 (and also in 1999), the theoretically expected strong positive relationship between war and migration appears.

Table 3.3 displays the results of the analysis of this new “modified basic model” and sets the stage for the next part of the present discussion. In the same fashion as before, most of the anticipated relationships between the independent and dependent variables are observed, although there are some exceptions that must be commented upon here. First, the free movement of workers dummy does not have a significant positive relationship with changes in net migration rate. This null positive result is fairly consistent across different versions of this model and would normally lead one to omit it from further experiments. However, there are good theoretical and practical reasons to keep it, such as the fact that other authors (e.g., Fertig 2001; Boeri and Brücker 2000) discover significant positive relationships between the EU’s free worker mobility policy and migration levels. Its presence is also necessary in the projection step to see whether this policy has any important effects on CEEC10 migration levels. Therefore, the free worker movement dichotomous variable remains in this analysis despite this disappointing and unexpected outcome. The Regime Difference independent variable, the one that measures freedom in the migrant-sender country, also has no significant positive relationship with changes in net migration rate. A thorough investigation into this unanticipated result determines that many of the years where several of the donor countries had dictatorial governments were also years of generalized European economic difficulties. These problems would encourage return migration and thus disguise the expected significantly positive relationship with the dependent variable. Although the results of this data examination<sup>33</sup> are not as clear-cut as they are in the case of Political

Table 3.3: Estimation Results for Modified Basic Model

Variable Name	Coefficient	t-value	sig
Change Ln (GDP Ratio)	0.0020185	7.38	0.000
Change Ln (German Employment)	0.0102745	6.09	0.000
Change Ln (Donor-Country Employment)	-0.0024205	-4.44	0.000
Per Capita Migrant Stock	-0.0197455	-2.67	0.008
Lag Ln (GDP Ratio)	-0.0003221	-4.71	0.000
Lag Ln (German Employment)	0.0008298	1.78	0.075
Lag Ln (Donor-Country Employment)	-0.0010300	-4.42	0.000
Lag Net Migration Rate	-0.4319264	-16.16	0.000
Free Movement	0.0000142	0.94	0.346
Guest Worker	0.0004520	4.61	0.000
Worker Repatriation	-0.0006605	-3.85	0.000
War Only	0.0032484	4.46	0.000
Regime Difference	0.0000769	1.09	0.277
Australia	0.0008971	0.44	0.662
Austria	0.0015995	0.76	0.447
Belgium	0.0009428	0.46	0.646
Canada	0.0008429	0.41	0.681
Denmark	0.0009402	0.46	0.648
Finland	0.0010222	0.50	0.619
France	0.0009306	0.45	0.651
Greece	0.0017218	0.80	0.421
Ireland	0.0011094	0.54	0.589
Italy	0.0010311	0.50	0.618
Japan	0.0010183	0.50	0.620
Luxembourg	0.0012206	0.59	0.557
Netherlands	0.0010912	0.53	0.598
Norway	0.0009700	0.47	0.637
Portugal	0.0013097	0.63	0.527
Spain	0.0009819	0.48	0.633
Sweden	0.0009477	0.46	0.645
Switzerland	0.0009009	0.44	0.662
Turkey	0.0018882	0.90	0.370
United Kingdom	0.0009481	0.46	0.644
United States	0.0008128	0.40	0.692
Yugoslavia	0.0016625	0.78	0.434

Dependent variable: change in net migration rate ( $\Delta mr_{dt}$ )

Number of observations: N = 946

Wald  $\chi^2$  (35) = 411.85 (0.0000)

Troubles, they are convincing enough to explain what happened with this variable. The third unexpected result that is notable here is the negative and significant one between the dependent variable and per capita migrant stock. Although this association is in accord with what Fertig (2001, 714) finds, it contradicts network theory's assertion that a larger stock of a sender-country's migrants in a receiver country should persuade more fellow potential migrants to move. This result is fairly, but not perfectly, consistent<sup>34</sup> across different variations of the modified basic model, which might initially lead one to argue that Fertig's observation may be correct in this instance.

A far more important irregular result from this investigation can be detected in the relationships between the GDP ratio variables and change in net migration rate. As expected, the GDP ratio change variable<sup>35</sup> has a very strong and consistently positive association with the dependent variable; however, the lagged ratio variable has a significantly negative relationship with change in net migration rate. No other pair of change and lag variables evinces this pattern of switching signs<sup>36</sup> between them, and it is unclear from a theoretical perspective why such a variation would occur or what it means in terms of the data. This relationship anomaly has tremendous implications for the projections in this analysis because it suggests that as the GDP ratio between two countries shrinks, more people are induced to move from the sender countries to the receivers. Although this conclusion might make some degree of sense in terms of regional integration<sup>37</sup> theory, shrinking economic differences between Germany and its sender countries should not create larger motivations for workers to move<sup>38</sup> from the latter to the former.

Whenever an unexpected result such as this one materializes in an investigation, several potential reasons for it could be present. One possibility is that the statistical technique used to analyze the data is misapplied, faulty or inappropriate for the problem at hand. After careful consideration, however, this option is rejected because a very similar technique has been successfully employed for this problem in the past (Fertig) and all relevant considerations to choice of methodologies (e.g., panel data, autocorrelation<sup>39</sup>, heteroscedasticity) seem to be addressed here. However, the country-specific variables that Fertig utilizes are not strictly necessary for the projections (Brücker and Siliverstovs), although it would be preferable if they were included.

Secondly, there could be problems with the data set itself. That concern is especially relevant given the apprehensions that previous authors<sup>40</sup> (Boeri and Brücker 2000; Fertig) have about migration data from Yugoslavia, particularly during the war years of the early to mid-1990s. These points are tested by removing the Yugoslav data from the modified basic model and by doing the same to all donor-countries' data from 1991 to 1995. In neither case are there any appreciable changes in the sign or significance of the lagged GDP ratio variable, although omitting the Yugoslav data does make the free movement of workers dummy significant (figures available upon request). Another potential data set problem is that the political and economic changes engendered by the end of the Cold War in Europe altered migration patterns to the point that results that would have seemed unbelievable prior to 1991 may now be correct. This option is examined by placing a dummy variable called Post90 in the modified basic model to test whether there is any significant difference between the relevant time periods in terms of the independent variables' relationships with change in net migration rate, and by running

the analysis again using only data from before<sup>41</sup> 1991. Even though the post-1990 dummy does not demonstrate any significant differences between the time periods, the experiment that only utilizes the pre-1991 data does (Table 3.4). Of particular importance<sup>42</sup> for the purposes of this discussion is the fact that both the change and lagged GDP ratio variables are now significant positive predictors of the dependent variable. It remains unclear what specific alterations in the data would have led to this result, but there is at least some evidence here that the end of the Cold War modified some important features of the migration variable relationships.

Yet another possible cause of the unusual result for the lagged GDP ratio variable is that it is interacting with other independent variables in the model (just like absorption capacity and German employment do earlier). Of particular concern here are the insignificant substantive dummy variables for free worker movement and regime difference along with the country-specific dichotomous variables at the end of the model. Eliminating the insignificant dummies has no effect on any other independent variables in the model, but some interesting results come about when one removes the country-specific variables<sup>43</sup> from the equation (Table 3.5). For example, the sign and magnitude of the migration stock variable switches from significantly negative to insignificantly positive. However, of far more interest to this analysis is the fact that the lagged GDP ratio variable is now an insignificantly positive predictor of change in net migration rate. This observation indicates that it is possible that the country-specific variables are masking the true and predicted positive relationship between these two variables. If that is the case, it might be acceptable to use these coefficients to forecast net CEEC10 worker migration. What this decision implies is that these projections would treat all

Table 3.4: Estimation Results for Modified Basic Model (1960-1990 Data Only)

Variable Name	Coefficient	t-value	sig
Change Ln (GDP Ratio)	0.0028027	15.09	0.000
Change Ln (German Employment)	0.0174243	11.54	0.000
Change Ln (Donor-Country Employment)	-0.0028387	-6.69	0.000
Per Capita Migrant Stock	-0.0315602	-4.00	0.000
Lag Ln (GDP Ratio)	0.0000791	1.80	0.072
Lag Ln (German Employment)	0.0009011	1.38	0.167
Lag Ln (Donor-Country Employment)	-0.0017432	-6.63	0.000
Lag Net Migration Rate	-0.4086896	-17.37	0.000
Free Movement	0.0000252	1.54	0.123
Guest Worker	0.0005740	6.47	0.000
Worker Repatriation	-0.0002496	-1.40	0.161
Regime Difference	0.0000433	0.71	0.480
Australia	0.0038526	1.63	0.104
Austria	0.0048343	2.02	0.043
Belgium	0.0038795	1.64	0.102
Canada	0.0038013	1.60	0.109
Denmark	0.0039316	1.66	0.097
Finland	0.0039714	1.68	0.094
France	0.0039028	1.65	0.100
Greece	0.0047191	1.94	0.053
Ireland	0.0038201	1.61	0.107
Italy	0.0038954	1.64	0.102
Japan	0.0039675	1.68	0.094
Luxembourg	0.0044184	1.86	0.063
Netherlands	0.0041074	1.73	0.084
Norway	0.0039649	1.67	0.094
Portugal	0.0039744	1.67	0.095
Spain	0.0036962	1.55	0.120
Sweden	0.0039474	1.67	0.096
Switzerland	0.0040858	1.72	0.085
Turkey	0.0044387	1.85	0.064
United Kingdom	0.0038678	1.63	0.103
United States	0.0038552	1.62	0.104
Yugoslavia	0.0045538	1.89	0.059

Dependent variable: change in net migration rate ( $\Delta mr_{dt}$ )

Number of observations: N = 660

Wald  $\chi^2$  (34) = 843.00 (0.0000)

Table 3.5: Estimation Results for Modified Basic Model without Country-Specific and Several Dummy Variables

Variable Name	Coefficient	t-value	sig
Change Ln (GDP Ratio)	0.0024570	9.75	0.000
Change Ln (German Employment)	0.0121306	6.25	0.000
Change Ln (Donor-Country Employment)	-0.0013465	-2.84	0.005
Per Capita Migrant Stock	0.0020583	0.96	0.336
Lag Ln (GDP Ratio)	0.0000347	1.30	0.195
Lag Ln (German Employment)	0.0003458	2.22	0.027
Lag Ln (Donor-Country Employment)	-0.0003338	-2.13	0.033
Lag Net Migration Rate	-0.3456958	-13.96	0.000
Free Movement	0.0000046	0.52	0.603

Dependent variable: change in net migration rate ( $\Delta mr_{dt}$ )

Number of observations: N = 946

Wald  $\chi^2$  (9) = 352.22 (0.0000)

countries as if their citizens have the exact same incentives to migrate and these forecasts would forego the use of the time-invariant variables listed in Hypothesis 5. While this outcome is not what this study intended from the beginning and it represents a sacrifice of part of the model's explanatory value, the results of Brücker and Siliverstovs' (2006) tests of the forecasting power of various estimators should eliminate any doubt about the propriety of this step. What these authors discover is that, although other estimators outperform GLS estimators more generally, there is very little difference<sup>44</sup> between the forecasting performance of GLS estimators that utilize time-invariant variables and those that do not. In other words, estimating the model without the country-specific effects and then conducting a projection using those estimators is legitimate.

A final potential reason for these unusual results is that this analysis discovers something new about the European migration system; in other words, there is nothing wrong with the modified basic model as it originally stands. Even though these findings run counter to the established literature on this subject, one must be open to the possibility that new results correctly contradict previous studies. It also implies that the information from Table 3.3 should be utilized in a projection to determine whether these results could be valid. What this explication implies for this research overall is that three basic projection models (one using the information from Table 3.3, one utilizing the coefficients from Table 3.4, and a third taken from the data in Table 3.5) are calculated and compared to discuss the plausibility of their results and the consequences of accepting each of these forecasts as accurate.

*Southern European Data Models*--One of the items that some previous explication of this analysis promises is that it would include models that employ data from "Southern

European”<sup>45</sup> countries that have historically been relatively economically disadvantaged in comparison to others in the full data set. That pledge exists because it might be asserted that models that use these data would grant more accurate predictions of CEE migrant flows due to their similarly economically deprived status in comparison with most of Western Europe. In order to maintain methodological consistency, the same initial basic model is estimated for the Southern European data as for the complete data set. Perhaps not surprisingly, the same problems with the absorption capacity and Political Troubles independent variables are discovered here, and so the same steps are taken as above to deal with these issues. Those actions create a modified basic model using the Southern European data that produces results (Table 3.6) that are quite similar to those of the complete-data model. For instance, all of the change in level variables are statistically significant in their anticipated directions, and the theoretically unexpected (but identical to the full-data) result of a negative relationship between migrant stock and the dependent variable is found here. Additionally, the unusual outcome of a positive change in GDP ratio relationship with change in net migration rate but a negative lagged GDP ratio correlation with that same dependent variable is in evidence. Investigations into the origins of these findings like those outlined previously turn up very similar results to what is found in the complete-data model (e.g.: no effect of the addition of a post-1990 dummy; the lagged GDP ratio variable’s sign changes when using only pre-1990 data points) with one critical exception. The removal of the Yugoslav or the post-1990 data, even just the figures from 1991 through 1995, have an appreciably deleterious effect on the significance of the change in GDP ratio independent variable’s relationship with change in net migration rate. In other words, important portions of the Southern

Table 3.6: Estimation Results for Modified Basic Model Using Southern European Data

Variable Name	Coefficient	t-value	sig
Change Ln (GDP Ratio)	0.0021721	1.90	0.057
Change Ln (German Employment)	0.0199230	3.47	0.001
Change Ln (Donor-Country Employment)	-0.0052095	-2.06	0.039
Per Capita Migrant Stock	-0.0157209	-1.23	0.217
Lag Ln (GDP Ratio)	-0.0003099	-1.07	0.286
Lag Ln (German Employment)	0.0008882	0.37	0.709
Lag Ln (Donor-Country Employment)	-0.0010275	-1.16	0.244
Lag Net Migration Rate	-0.5197133	-9.63	0.000
Free Movement	0.0000618	0.69	0.490
Guest Worker	0.0004718	2.90	0.004
Worker Repatriation	-0.0005817	-2.15	0.032
War Only	0.0030822	3.44	0.001
Regime Difference	0.0000822	0.61	0.541
Greece	0.0013489	0.14	0.892
Ireland	0.0008162	0.08	0.935
Italy	0.0007000	0.07	0.944
Portugal	0.0010072	0.10	0.919
Spain	0.0006777	0.07	0.946
Turkey	0.0015717	0.16	0.873
Yugoslavia	0.0013999	0.14	0.887

Dependent variable: change in net migration rate ( $\Delta mr_{dt}$ )

Number of observations: N = 301

Wald  $\chi^2$  (20) = 129.01 (0.0000)

European modified basic model's results are rather dependent on these particular data points. That conclusion implies that the coefficients derived from models using just the Southern European data are likely to be unstable and thus unsuitable for projection models. In short, forecasts of CEE migration to the EU15 countries are not made using only the Southern European data in this analysis due to this outcome.

*Time-Invariant Variables Calculations*--Although several different sets of full-data projections are pursued in this analysis, only one fixed-effect regression is described in detail presently because the process and results are virtually identical for each of the procedures. As described earlier, this stage of the analysis consists of conducting an OLS regression with the twenty-two country-specific coefficients comprising the dependent variable's data and the five fixed-effects variables discussed in Hypothesis 5 as the independent variables. Table 3.7a displays the pertinent results<sup>46</sup> of the complete OLS regression for the modified basic model's GLS regression (Table 3.3). As can clearly be seen in this table, the initial results of the full model do not resemble what was initially predicted; for example, only one independent variable (HDI) is a significant predictor of the dependent variable in the expected direction. However, since the border dummy has some degree of collinearity with the language one (Pearson's  $r = .582$ ) and one could argue that it is measuring much the same concept as the distance variable is, the border dichotomous variable is omitted from further regressions. That act immediately permits the language variable's significant positive relationship with the dependent variable to be observed, even though the rest of the independent variables (aside from HDI) remain insignificant. The next inconsequential variable to be removed from the analysis is distance, especially since neither Boeri and Brücker (2000, 120) nor Fertig (2001, 716)

Table 3.7a: Estimation Results for Modified Basic Model's Time-Invariant Variables (All Hypothesis 5 Variables)

Variable Name	Coefficient	t-value	sig
HDI	-0.0049840	-5.07	0.000
Language	0.0002401	1.61	0.126
Distance	-5.75e-09	-.047	0.647
Border	-0.0000269	-.022	0.831
Global City	-0.0001341	-1.36	0.192
constant	0.0057939	6.46	0.000

Dependent variable: country-specific fixed effects  
 Number of observations: N = 22  
 F-test (5, 16) = 7.57 (0.0008)  
 Adjusted R<sup>2</sup> = 0.6101

Table 3.7b: Estimation Results for Modified Basic Model's Time-Invariant Variables (Significant Hypothesis 5 Variables Only)

Variable Name	Coefficient	t-value	sig
HDI	-0.0053931	-5.94	0.000
Language	0.0002315	1.93	0.068
constant	0.0061161	7.24	0.000

Dependent variable: country-specific fixed effects  
 Number of observations: N = 22  
 F-test (2, 19) = 18.25 (0.0000)  
 Adjusted R<sup>2</sup> = 0.6217

find that distance has a significant impact on the dependent variable. This step has no effect on the ability of the sender-country global city presence dummy to be a significant predictor<sup>47</sup> of the dependent variable, although in a few cases it is close to passing the 0.1 significance cutoff point in the expected direction. Removing the global city presence dichotomous variable from the analysis leaves only the human development index and language measures (Table 3.7b) as variables that could be carried over into the projection phase of this analysis.

*Steady-State Estimators Calculations*--Since the process of computing the long-term estimators is the same for all three model variants, only one instance of this work is fully described here in order to conserve time and space. Table 3.8 presents the steady-state coefficients for the modified basic model's analysis. These figures are calculated by dividing each of the relevant coefficients by the one for the lag of the dependent variable (multiplied by negative one for the reason outlined above). These coefficients are the ones that are employed for the projections because they should omit any short-term effects on the migration patterns under study (Fertig, 717). It should be noted here that only certain independent variables are brought forward into the forecasting section of this project. For instance, none of the five dichotomous variables described in Hypothesis 4 are utilized in the forecasts, except for free movement, because it is exceedingly unlikely that the CEE countries that are the focus of these projections will have a regime difference, guest worker scheme, or migrant return program<sup>48</sup> with Germany (or experience a civil war) in any reasonable future. The free movement variable is used in these projections, even though it is not generally<sup>49</sup> a significant predictor of the dependent variable, because it is a policy feature of great interest to this project. Additionally, other

Table 3.8: Modified Basic Model's Steady-State (Long-Run) Coefficients

Variable Name	Coefficient	Long-Run Coefficient
Per Capita Migrant Stock	-0.0197455	-0.0457150
Lag Ln (GDP Ratio)	-0.0003221	-0.0007457
Lag Ln (German Employment)	0.0008298	0.0019212
Lag Ln (Donor-Country Employment)	-0.0010300	-0.0023847
Free Movement	0.0000142	0.0000329
HDI	-0.0053931	-0.0124862

Lag Net Migration Rate ( $\beta_{10}$ ) = -0.4319264

authors (e.g., Boeri and Brücker 2000) determine that it can have a positive effect on worker migration. Furthermore, the significant language variable from the Hypothesis 5 OLS regressions is omitted from the forecasts because none of the ten CEE countries of interest here have a language similarity with Germany. Finally, the migrant stock variable is included in the projections despite lingering questions about the direction of its impact on migration since there is considerable reason (from network theory and even its detractors) to believe that it has some influence on this phenomenon. In short, the choice of projection variables is driven by statistical significance, theoretical importance, and practical decision-making.

### **Projections:**

Prior to describing the results of the various forecasts that are performed in this analysis, it is critical to explicate the conditions that are assumed to hold true in their “future”. First, in order to simplify comparisons between these results and those of the literature projections, it is supposed here that all ten CEE new member states join the EU in 2004. Additionally, the baseline economic conditions that are presumed to exist for all three of the projection models include an annual two-percent GDP convergence between Germany and each CEE member state and a static employment<sup>50</sup> situation. The employment figures that are utilized in these forecasts are the averages of each country’s employment between 1996 (the first year ILO unemployment data are available for all ten CEECs) and 2003. Given the seven-year derogation on free worker mobility included in each CEE state’s accession treaty and the political pressures facing EU15 politicians in 2003, these forecasts also initially assume that all of the EU15 countries fully exercise this provision (i.e., completely free intra-EU migration does not occur until 2011). Since

the Human Development Index scores do not change much over short periods of time, it is presumed that these figures remain the same over the entire projection period (roughly 25 years, from 2004 to 2030). Following Fertig (2001, 718), all of these forecasts also allow the migration stocks to collect year by year and then cumulatively impact the next year's figures; in addition, it is also assumed here that births into and deaths out of these stocks are equal. Finally, the baseline projection presumes that the CEE countries' populations remain static throughout the forecasting period. Given the demographics of this part of Europe over the past twenty years, taking a steady-state initial approach might be appropriate. Even if there are objections to some of these assumptions, however, many of them are adjusted in the alternative projections that follow or could be changed in the future if necessary.

Given the problematic results of the country-specific effects regressions, perhaps it is not surprising that the projections that employ the coefficients derived from these regressions are troubling as well. In both<sup>51</sup> the full-data modified basic model and the one that utilizes only information from 1960 to 1990, the projected migrant outflow in the first year of the forecast exhausts the total migrant stock in Germany for each sender country. In other words, these forecasts would predict that more Bulgarians than lived in Germany in 2004 would return home from the receiver country in that year, for instance. While a negative net migrant flow from the host country is not a sign<sup>52</sup> of a faulty model, predicting that in one year every Central and Eastern European worker leaves Germany for home (and then some) is clearly ridiculous. The primary culprit for this result is the relatively large negative value for the HDI coefficient; to a lesser extent, the negative wage ratio value<sup>53</sup> in the full-data modified basic model contributes to that forecast's

problems. Again, given the interaction issues that plague the country-specific variables that spawned the HDI coefficient, this discovery should not be particularly startling. While it could have been asserted from the start of this process that the pre-1991 data projection would be invalid due to truncated data issues, the results of the forecast using the complete data set and country-specific variables are rather disappointing.

Far more encouraging are the results from the projection that omits the country-specific variables<sup>54</sup> entirely; Table 3.9 contains the long-term coefficients for this model. This forecast (Table 3.10) claims that only a small percentage (1.39%) of the CEEC10 member states' populations will migrate to the EU15 countries over the first quarter-century of their countries' EU membership. This figure falls below that of the consensus band discussed in the literature review, but it is not an unreasonable estimate given the theoretical expectations of this analysis. The projected migration flow figures also perform reasonably well dynamically, with only small increases or decreases in the rate of these changes until a near-plateau in that growth is reached in many cases (Table 3.11). This pattern is somewhat similar to how Boeri and Brücker's (2000) and Fertig's (2001) forecasts behave. The lone exception to the plateau observation occurs when fully free mobility of workers is introduced in 2011. There is a one-year spike in migrants for all ten donor countries then, but the pattern of slow growth or shrinkage in migration rates quickly resumes. To test the accuracy of this forecast model, the relevant 2003 economic and political conditions are also programmed into it and the result of these calculations can be compared with the actual CEEC10 net migration totals that are observed for that year. While the model would forecast that 33,522 net CEE migrants would have moved to Germany in 2003, the actual total net migration from these

Table 3.9: No Country-Specific and Omitted Dummy Variables Steady-State Coefficients

Variable Name	Coefficient	Long-Run Coefficient
Per Capita Migrant Stock	0.0020583	0.0059541
Lag Ln (GDP Ratio)	0.0000347	0.0001004
Lag Ln (German Employment)	0.0003458	0.0010003
Lag Ln (Donor-Country Employment)	-0.0003338	-0.0009656
Free Movement	0.0000046	0.0000132

Lag Net Migration Rate ( $\beta_{10}$ ) = -0.3456958

Table 3.10: Baseline Projection of Migration to Germany by CEEC10 Member State

Country	2004-2030 Migrants
Bulgaria	80,755
Czech Republic	60,770
Estonia	8,317
Hungary	71,598
Latvia	19,826
Lithuania	31,933
Poland	392,887
Romania	199,000
Slovakia	48,399
Slovenia	12,573
Total	926,059

Total CEEC10 Migrants to All EU15 Member States: 1,423,831

Total 2003 CEEC10 Population: 102,594,000

Percentage of CEEC10 Population Migration to EU15 Countries: 1.388%

Table 3.11: Baseline Projection of Migration to Germany by CEEC10 Member State and for Selected Years

Country	2004	2010	2011	2015	2020	2025	2030	Total
Bulgaria	2888	2898	3003	3012	3024	3036	3049	80,755
Czech Republic	2240	2198	2326	2299	2266	2232	2196	60,770
Estonia	306	301	318	314	310	306	302	8,317
Hungary	2610	2582	2711	2694	2674	2652	2631	71,598
Latvia	715	713	743	742	741	740	739	19,826
Lithuania	1148	1147	1193	1194	1195	1196	1197	31,933
Poland	14053	14100	14612	14654	14710	14769	14830	392,887
Romania	7155	7151	7437	7440	7446	7451	7457	199,000
Slovakia	1742	1740	1810	1810	1811	1811	1812	48,399
Slovenia	462	454	479	475	469	463	457	12,573

countries was 33,085 individuals in that year, a difference of roughly 1.30 percent. Despite the uncertainties involved in any projection model, this outcome certainly bolsters one's confidence in its potential accuracy.

In order to test whether the baseline projection is overly dependent on any particular coefficient and to explore the effect of an important worker migration policy on these results, a number of alternative projections using different starting assumptions are performed here (Table 3.12). The "low-incentive" projection presumes that economic convergence between the CEEC10 and Germany would be three percent per forecast year, unemployment in Germany would remain at a constant ten percent during this period, and CEEC10 unemployment would be seven percent<sup>55</sup> during this time. Although the three percent convergence figure is utilized by Boeri and Brücker (2000, 124) in their low-incentive projection as well, the above unemployment figures are included because they represent approximately the highest German and lowest CEE country unemployment during the eight years prior to 2004. The "high-incentive" forecast adopts nearly mirror-image figures for economic convergence (one percent) and unemployment (seven percent German and fifteen percent CEEC10) during the projection period for similar reasons. As might be anticipated from the titles of the remaining alternatives, the "free movement 2004" projection supposes that there are no barriers to CEE worker movement from the first moment of Eastern enlargement and the "no free movement" forecast postulates that this policy is never implemented by the EU15 governments. As can be seen in the relevant table, in none of these cases<sup>56</sup> do these alterations create considerable changes in the total migration flows. For instance, the policy choices of starting free worker movement in 2004 (1.40%) or never putting this policy into effect (1.35%) barely budge

Table 3.12: Alternative Projections of 2004-2030 CEEC10 Migration

Country	Low-Incentive	High-Incentive	Free Movement 2004	No Free Movement
Bulgaria	54,670	88,090	81,595	78,583
Czech Republic	52,867	96,443	61,865	57,937
Estonia	5,586	11,369	8,463	7,941
Hungary	63,329	106,598	72,685	68,786
Latvia	12,603	22,534	20,076	19,181
Lithuania	20,732	35,485	32,303	30,974
Poland	263,645	426,790	396,987	382,283
Romania	182,986	275,821	201,333	192,966
Slovakia	29,346	52,322	48,977	46,906
Slovenia	11,087	19,617	12,788	12,019
Total (Germany)	696,851	1,135,068	937,071	897,576
Total (EU15)	1,071,419	1,745,185	1,440,762	1,380,037
%CEEC10 Migration	1.044	1.701	1.404	1.345

the migration percentage from what is derived from the baseline case. While the overall numbers do not vary a great deal, there are some interesting observations to be made here concerning how individual countries' predicted migration rates shift due to these assumption modifications. An example of that statement can be detected in comparing how Bulgaria's and Czech Republic's numbers change in the low and high-incentive projections. Since the Czech Republic's unemployment rate is at the low end of the range of CEEC10 values between 1996 and 2003, its net migration rate is not much different in the low-incentive alternative than the baseline case. A similar assertion can be made regarding Bulgaria's net migration numbers in the high-incentive alternative due to its relatively elevated unemployment during this period.

#### **Discussion and Conclusion:**

Although some methodological changes have been required in the execution of this analysis compared to what was originally intended, one can come to some conclusions about the initial hypotheses proposed in this chapter. First, it has been mostly confirmed that the economic variables listed in Hypothesis 1 have statistically significant relationships in the theoretically expected directions with the change in sender-country net migration rate. In fact, the economic change in level variables have strongly significant relationships with the dependent variable (t-values below 0.01) in almost all model permutations. This finding is unsurprising, as it follows very closely what earlier economists, political scientists, and other migration experts discover in their research. Additionally, the lagged versions of these variables follow the same pattern<sup>57</sup> for the most part, except for the lagged wage ratio variable. Its apparent interactions with the country-specific variables and some of the dummies conceals the expected positive relationship

between it and change in net migration rate, which is a major reason why the methodological alterations alluded to earlier are made.

Definitive conclusions about the importance of the migrant stock variable are not as easy to state, however. In most versions of the basic and modified basic model, migrant stock is a significantly negative predictor of change in the net migration rate; in other words, the larger the number of donor-country migrants who live in the receiver country, the fewer such workers are induced to move in that year. This finding contradicts what would be predicted by network theory and at least some statistical investigations of the effect of migrant stocks on the willingness of sender-country workers to leave home. On the other hand, this result may be a statistical figment based on the migrant stock variable's interactions with the country-specific variables. Removing only these dummies from the model uncovers a significantly positive relationship between migrant stock and change in net migration rate (t-value = 2.00; results not shown); even when several substantive dummies are removed from this version of the model, migrant stock remains a positive but insignificant predictor of the dependent variable (Table 3.5). It is unclear why migrant stock would interact with the country-specific dichotomous variables, so in the end one should probably just aver that no firm inferences can be made in this analysis about the relationship between these two variables. A similar statement could be made about the absorption capacity measure due to its high correlation with the German employment variable. In the basic model, it certainly seems to have a considerably significant relationship with net migration rate change in the expected direction, but one cannot be sure why that is the case due to collinearity issues.

However, no such reticence is necessary when discussing the dichotomous variables in the GLS regressions because almost all of them have clearly definable relationships with the dependent variable. Wars (although not political instability more generally), guest worker policies, and migrant return programs all have significant effects on the dependent variable in their expected directions. On the other hand, in most versions of these models free worker migration policies and political system differences have insignificantly positive impacts on changes in net migration rates. As detailed earlier, the free migration variable is brought forward into the projection stage despite its insignificance<sup>58</sup> because one of the driving forces behind this research is to explore how potential EU and member-state policy choices may affect worker migration. Although these variables are underutilized in the forecasting phase of this research, conclusions about the ones from Hypothesis 5 can also be drawn based on the fixed-effects OLS regressions. For example, language similarities between countries have a significantly positive effect on worker migration, while similar levels of social development between states tends to significantly discourage it. However, increasing distance between major state population centers, sharing a border, and the presence of a global city in the sender country does not appear to have a significant impact on net migration rate changes (even though global city presence is fairly close to the cutoff score in many instances). In short, this analysis confirms Boeri and Brücker's (2000, 121) findings about many of these time-invariant variables.

The projection results obtained from the non-fixed effects GLS regression coefficients do not quite conform to the consensus forecast that asserts that two to four percent of the Central and Eastern European member-states' population would move to

the EU15 countries in the long-term aftermath of CEEC10 accession. In fact, the current analysis' projection implies that fewer people than the consensus models predict will move in the first twenty-five years or so of the CEEC10's EU membership. That observation is found even under a number of different forecast conditions, including one designed to maximize the economic incentives for CEEC10 workers to move. The question then becomes how EU15 politicians should have reacted to a prediction such as this one, especially in light of earlier assertions that forecasts of two to four-percent worker movement over a long-term time horizon should not have excited great political tumult against the new member-state workers. Although much more is stated on this point in the concluding chapter of this dissertation, perhaps an indication of what these conclusions would be can be gathered by briefly contextualizing these results in the truncated post-enlargement history of CEE welfare tourism in the EU15 countries.

*Case Study*--"Welfare tourism", otherwise known as "benefit tourism" or "welfare shopping" among other names, is the notion that poor-country workers regularly change locations to wealthier states in order to take advantage of the more generous social welfare benefits available in the latter countries (Doyle et. al., 8; Ruhs, 22; Pollard et. al., 31). Although the EU has tried, especially through European Court of Justice case law, to encourage its member-states to treat all EU citizens equally when it comes to social welfare benefit acquisition, EU countries may still discriminate between its own citizens and other member-state citizens when certain such benefits are at question. For instance, EU countries must treat all EU citizens equally when it comes to work-related social benefits (unemployment, particular tax credits), but the UK has been able to limit the ability of post-accession CEEC8 citizens to acquire non-work related welfare benefits

during their first year of registered work in that country (Maas, 64-66; van der Mei, 107-117; Ruhs, 22). This situation contrasts with that of the United States, where every state must treat all legal residents identically when determining social welfare benefit eligibility, regardless of how long the applicants have lived in the state that is paying out the subsidy. Despite the fact that EU case law has moved a long way toward the American model in this area, it is unlikely that EU citizens will have full access to all member-states' welfare systems on the same basis in the foreseeable future given the political sensitivities surrounding this issue (van der Mei, 117-122).

One of the most commonly-repeated arguments against CEE accession prior to its commencement was that welfare tourists from those countries would inundate the EU15 economies, straining these systems to their breaking point (Doyle et. al., 8-9; Pollard et. al., 31; Brochmann and Dölvik, 157-158, 170). This contention continued to be made during this period in spite of the presence of policies designed to prevent benefit tourism and a host of research (Lord Wright, 11-12; Bengtsson et. al., 49-51; Bauer et. al, 238-242; Chiswick and Sullivan, 559-560; Pritchett, 96-98; Kunz and Leinonen, 152-153) that demonstrates that migrants are either a net contributor to national welfare systems or at worst have an unclear overall effect on these programs. Concerns about welfare tourism are not totally inappropriate, of course, as a particularly generous welfare state could theoretically attract substantial numbers of low-skill migrants. These individuals would not only be potentially greater users of wealthy-country welfare systems but also represent increased competition for low-skill native workers who constitute the most economically vulnerable segment of the host-country population (and thus often heavy users of their countries' social welfare programs). These native workers, who represent

many votes at election time, would be expected to protest increased migration and threats of welfare shopping due to the migrants' potential for increased competition for jobs and social welfare resources. Politicians must listen to these voters if they want to stay in office in spite of what the evidence may state, but the question then turns into whether fears of welfare tourism were any better-grounded during the 2000s in the EU15 countries than at any other time or place (Razin and Sadka, 49-80; Piore, 168-170; Pritchett, 98; Brochmann and Dölvik, 172).

A good test of this proposition would be to examine the situation in the UK, especially as it relates to Polish migrant workers in that country. If there were any EU15 member state where welfare tourism might have taken place in the first few years after CEEC8 accession, it would be the UK given their immediate implementation of the free worker migration policy and the large numbers of CEE workers that attracted to the UK's economy. Polish workers are by far the most numerous such workers who have been drawn to the UK economy; more specifically, about two-thirds of all approved UK Worker Registration Scheme applications in the first thirty months after CEEC8 accession were filed by Polish citizens. In fact, Polish nationals now represent the largest ethnic minority in the UK even though they only ranked in thirteenth place on that score in 2004. This hefty influx has had numerous consequences for the British economy, ranging from the noteworthy observation that the flight destination patterns of the UK's airports have been altered to the trivial reflection that Polish beer is now far more available in the UK than it once was (Herm, 10; Pollard et. al., 5-6, 24; Vasileva, 5). However, there is virtually no evidence of welfare shopping in the UK<sup>59</sup> by these Polish migrants or by any of the other ones from the CEEC8. In the first year or so after CEEC8

accession, less than two percent of the National Insurance Numbers (NiNos) allocated to CEEC8 workers in the UK had been utilized to access social welfare benefits; the rest were used for employment purposes only (Ruhs, 22-23). Not much changed in the next few years after accession either, as by December 2007 only 2.4 percent of the NiNos given to CEEC8 workers had been used to access benefits. Out of that percentage, only about one-third had been utilized for the purpose of taking advantage of non-tax credit based welfare programs (Pollard et. al., 31-32). This trend has continued, as fewer than three percent of 2007-2008 NiNo registrants from all twelve 2004 and 2007 accession countries were collecting any kind of welfare benefits six months after their registration in the program (Salt 2009, 59).

Another assessment of the welfare tourism hypothesis might include an examination of the response of CEEC10 migrant workers to the economic downturn that began in 2008. Although the evidence for scrutinizing this phenomenon is unavoidably anecdotal, it seems as though many such workers are leaving for home rather than staying in their destination country to receive welfare benefits or are just not coming to the EU15 economies<sup>60</sup> at all (Economist 2008; Economist 2009a; BBC News 2009a; Donadio and Schwartz; Lungescu 2009). As Wallace (2002, 616) notes, European social welfare benefits are not transportable, so many CEE migrants would be incentivized to depart Western Europe when a recession hits to take advantage of the sender-country benefits that they are clearly entitled to exploit. In fact, Wallace further argues that European social welfare systems should act as a deterrent to initial migration<sup>61</sup> rather than as an incentive to do so, and that there should be “circular migration” patterns observed between the CEE and EU15 countries. This phenomenon appears to have been what was

already happening in the UK prior to the late-2000s recession, and one could speculate that these economic problems have merely accelerated this process. For instance, Pollard and her co-authors (2008, 5) report that approximately half of the CEEC8 workers who took up positions in the UK between 2004 and 2007 have already left for home. The observed rapid outflow of CEEC8 workers (Economist 2008; BBC News 2009a) from the UK in the last few years may simply represent a reverse wave in an already-existing circular migration pattern. In the final analysis, however, there is very little evidence to support the notion that CEE welfare tourism is occurring on any significant level.

*Conclusion*--In ending this empirical findings chapter, it might be worthwhile to briefly recap what it has determined about worker migration in general and such movement between the CEE countries and the EU15 member states more specifically. First, it appears that the predictions of neo-classical economic theories of worker migration are supported to a satisfactory degree, although the same cannot be stated for the network or world systems theory points of view. While various political and public policy explanations of migration prove to be important determinants of this event, one of the most critical EU policies that is designed to encourage movement (free worker migration) is not sustained as a significant determinant of that behavior. Even though a slightly different methodological technique is required to generate it than was originally envisioned, the baseline migration projection using all of the information that would have been available to EU15 decision-makers in 2004 demonstrates that even fewer CEE workers are likely to arrive in their economies than the previous consensus figures would have indicated. Altering various parts of that forecast to make it more or less likely for these workers to shift places of employment does not change the general picture of

limited CEE worker migration very much. Finally, this portrait of constrained migration level predictions is fleshed out by a succinct discussion of the possibility of welfare tourism within the ranks of the CEE workers who arrived in the EU15 member states in or soon after 2004. In short, it appears that the vast majority of these workers who shifted locales did so to genuinely work and not to take advantage of the EU15's generous national welfare systems. As this analysis shifts into its next phase, it will be interesting to note what insights a different methodological technique, systems modeling, can bring to bear on the question of post-EU accession CEE worker migration.

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<sup>1</sup> A large portion of this chapter (and some parts of the rest of this dissertation) was presented as a paper entitled “A New Long-Term Forecast of Post-Accession CEEC10 Mobility to the EU15 Member States” at the 2010 Midwest Political Science Association Meeting on April 24, 2010.

<sup>2</sup> The twenty-two migrant sender countries for which data were collected from 1960 to 2003, the year before the CEEC8 joined the EU, are the following: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Greece, Ireland, Italy, Japan, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States, Yugoslavia. These states are included not just for reasons of data availability but also because they represent a satisfactorily broad cross-section of migration data for Germany. In fact, for many of the years in the sample, these countries comprise the great majority of the migrants to that country. Additionally, several of these states were in similar economic situations at the time that these migration data were gathered as the CEEC10 were in 2004. It should also be noted here that this total number of migrant donors represents an increase in the quantity of countries over that which has been used in past studies of CEE-EU labor migration. For example, Boeri and Brücker (2000) employ data from eighteen sender countries, while Dustmann et. al. (2003), Fertig (2001), and Fertig and Schmidt (2000) only utilize seventeen. Due to the use of differenced variables and one-year lags in these models, their maximum N is 946. All data concerning Germany refer to West German figures until 1990 and the reunified Germany for 1991 and beyond.

<sup>3</sup> Boeri and Brücker (2000, 2001, 2005) make the opposite decision on this controversy because they determine that migrant stock, not migration rate, is cointegrated with the economic explanatory variables used in most studies of this type. That fact implies that there is a long-term equilibrium relationship between their dependent and independent variables that they cannot demonstrate between migration rate and the relevant explanatory variables (Boeri and Brücker 2000, 114).

<sup>4</sup> Kupiszewski (2002, 637-640) complains at length about how previous migration studies place too much emphasis on the economic determinants of this phenomenon to the exclusion of all others. This study takes that criticism seriously, and includes a number of these concepts in its policy and fixed-effects variables elucidated below.

<sup>5</sup> It should be noted that transforming data by using the natural log of those values is a common technique in statistical work to reduce potential heteroscedasticity problems.

<sup>6</sup> Please see Hatton (1995) versus Zaiceva (2004), who also utilizes unemployment rather than employment figures, for these approaches to this issue.

<sup>7</sup> It is interesting that at least two authors of past studies in this area, Fertig (2001) and Zaiceva (2006), do not take this step, although Fertig does divide his stock figures by 100,000 for some unexplored reason. Note that these data cannot be transformed here by taking the natural log of these values because that action would result in negative values in the projection step of this project, thus altering the sign of the resulting calculation with the variable's coefficient.

<sup>8</sup> Given the identity of the dependent variable, the change in migrant stock regressor is also not utilized here for obvious reasons.

<sup>9</sup> A large number of vacant jobs may also indicate a shortage of certain skilled workers that the economy can only satisfy by hiring foreign labor, a fact that would change the identity of the workers being drawn to that economy but not the overall rate at which these workers arrive. It should also be noted that not all workers who are attracted to the host economy will have the “right” skills for the jobs that they take there; in fact, some of them may work at jobs that are below what their education and training would qualify them for at home in terms of status or be paid less than their counterparts in the same jobs (Batalova and Lowell, 97-101).

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<sup>10</sup> As far as can be determined from the literature in this area, this operationalization of absorption capacity is unique. Zaiceva (2006, 14) does utilize the term “absorptive capacity” when describing features of the host labor market, but her operationalization (host-country population) is quite different from the one utilized here and she only employs this variable in her fixed-effects estimators equations. Boeri and Brücker (2001, 11) discuss this term momentarily, but then do not operationalize it in their models.

<sup>11</sup> Leaving the issue of skills mismatches aside, one could also speculate that large numbers of vacant jobs in sender countries should dissuade their workers from going abroad to find employment and thus reduce the net migration rate. However, this variable is not included in this analysis due to serious data set limitations; for instance, only twelve of the twenty-two countries provide a complete run of the relevant data to the OECD (1993) for one of their historical statistics collections.

<sup>12</sup> As of September 1, 2009, the complete series of these scores for all 192 countries from 1972 to the present is also available as an Excel file from Freedom House’s web site: [www.freedomhouse.org/template.cfm?page=439](http://www.freedomhouse.org/template.cfm?page=439). The author projects these scores backwards in time to 1960 using the trends present in the Freedom House data, the seven-point scales and topics utilized by this organization, and information about the political situations in each of the 22 countries in this study. Only a few of these decisions (e.g., Turkey after the 1960 coup) could be considered controversial. In general, a country that possesses a score of: two through five on the combined political rights and civil liberties scales is “free”; six through ten (or eleven, depending on the year) is “partly free”; and anything above that is “not free”. In contrast to many of the other data sets concerning Yugoslavia, Freedom House adopts that name for this country for the entire period of this analysis.

<sup>13</sup> Boeri and Brücker (2000, 154) and Zaiceva (2006, 14) both employ the exact same data source for this notion, but the former authors refer to it as “quality of life” while the latter scholar uses the phrase “level of development” instead. That fact explains why this discussion uses both terms interchangeably.

<sup>14</sup> For unknown reasons, the 2003 HDI level for Luxembourg is omitted from the 2007-2008 version of the report, so it is obtained from the 2005 edition of that volume instead. Additionally, the 2003 HDI value for Yugoslavia is calculated by taking the average of the (nearly identical) HDI values for Serbia and Montenegro.

<sup>15</sup> The Human Development Index, which has a maximum value of one and a minimum value of zero, is really the unweighted average of three separate index scores (GDP, life expectancy, and education) that are scaled from zero to one. Each of these component parts is determined by setting a top and bottom “goalpost” for each of the three indexes and then calculating how close each country is to that goalpost. For instance, the minimum and maximum goalposts for life expectancy are twenty-five and eighty-five years, respectively. Turkey, which in 2005 boasted a life expectancy of 71.4 years, therefore has a life expectancy index score of 0.773 ( $(71.4-25)/(85-25) = 0.773$ ). The education and GDP index scores are established similarly, except that the former is actually the weighted average of each country’s adult literacy rate and gross school enrollment (primary, secondary and tertiary) ratio and the latter uses logged GDP values rather than the raw figures (United Nations 2008, 356). As one can discern, each state’s absolute value on the Human Development Index has little inherent meaning. However, its HDI value relative to other countries’ HDI values (and to the zero to one limits on this score) does signify its comparative level of development. This observation supports the notion that one can employ HDI as an independent variable in a fixed-effects regression because the states’ relative rankings on it do not change frequently over the years of interest (Boeri and Brücker 2000, 154).

<sup>16</sup> Migrant travel distances are derived from a commonly used air mileage calculator (the one on [infoplease.com](http://infoplease.com); this site remains functional as of September 1, 2009); please see this site for details as to how this tool calculates these mileages. It should be noted that Frankfurt am Main is employed as the German destination city for reasons other than that it is the primary financial center of this study’s migrant destination country. This choice avoids the issue of whether to use Bonn or Berlin, the two political capitals of Germany during the time period of interest, and places the destination somewhat nearer to the center of

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the country. Additionally, it is the only German city on Friedmann's (1986, 72) list of primary or secondary "world cities" (see the discussion of Hypothesis 5e for details).

<sup>17</sup> One could also contend that the presence of borders between relatively wealthy and underprivileged countries could discourage migration as cross-border commuters could choose to live on the poorer side of the border but earn wages in the nearby wealthy economy. This concern is an obvious one when the point of the current research is to project the permanent movement of CEE workers to Germany. Unfortunately, this analysis is not really constructed to deal with this problem even though it may attenuate the relationship predicted in the relevant hypothesis.

<sup>18</sup> The list of these primary global cities is comprised of London, Paris, Rotterdam, Frankfurt, Zurich, Tokyo, New York, Chicago and Los Angeles. Friedmann (1986, 72) also has a catalog of secondary global cities in his piece, including Brussels, Milan, Vienna, Madrid, Toronto, Sydney and Houston. The primary rather than the primary and secondary roll of cities is utilized in this research because there is little doubt that all of the primary conurbations are global centers of capitalism and this statement could certainly be made about these global cities throughout the time period of interest.

<sup>19</sup> The net migration figures for some, but not all, of the countries in this data set are even available back to 1952. Separate inflow and outflow data by migration country of origin are also available from the same source. In fact, one donor-country's annual entry (net migration data from Sweden in 1996) is omitted from the official file and is calculated from these data separately.

<sup>20</sup> Following the example of the German Federal Statistical Office in this matter, "Yugoslavia's" population excludes Slovenia, Croatia and Bosnia-Herzegovina from 1992 onward and Macedonia's population from 1993 forward. In other words, Yugoslavia is treated as Serbia and Montenegro from 1993 to 2003.

<sup>21</sup> Yugoslav migrant stock data covers the entire country up to 1991, but after 1992 it no longer includes Slovenia, Croatia and Bosnia-Herzegovina, and after 1993 it does not include Macedonia either. These figures do include "stateless Yugoslavs," however.

<sup>22</sup> Fertig (2001, 712) claims that migrant stock in Germany data are discoverable back to 1960, but extensive electronic communications between this author and the German Federal Statistical Office failed to produce information prior to 1967. Many thanks are due here to Christina Leib-Manz and Daniela Glock, two employees of the *Statistisches Bundesamt*, whose tireless efforts to find and convey this information are deeply appreciated.

<sup>23</sup> Per-capita GDP data are available in Maddison (2003) for all countries except Yugoslavia and Luxembourg from 1960 to 2001; updates for 2002 and 2003 can (as of September 1, 2009) be located on Maddison's web site: [http://www.ggd.net/maddison/Historical\\_Statistics/horizontal-file\\_03-2007.xls](http://www.ggd.net/maddison/Historical_Statistics/horizontal-file_03-2007.xls). Yugoslav data can be obtained from these sources until 1991; after that year, the figures for the successor state of Serbia and Montenegro are used instead. Luxembourg's 1960 to 2001 per-capita GDP data are interpolated from five data points provided by Maddison (2001, 2003) and then extrapolated based on GDP change for 2002 and 2003. This extrapolation is exactly the transformation that Boeri and Brücker (2000, 153) perform for all of their 1995 to 1998 per capita GDP data. Please see Maddison (1995, 2001) for data source information and details about how these data are transformed into comparable per-capita GDP values; this dissertation notes with sadness Professor Maddison's recent passing (Economist 2010).

<sup>24</sup> As of September 1, 2009, the data set associated with OECD (2008) can be located at the following web site: [www.sourceoecd.org/database/unemployment](http://www.sourceoecd.org/database/unemployment). Unfortunately, unemployment data for Luxembourg only go back to 1974 in this set, so data for the years 1960 through 1973 must be obtained from Info Statec, Luxembourg's national statistical agency. Yugoslavia's figures are also omitted from this data collection, so a number of other sources are necessary to gather this information. Woodward (1995, 383-384) publishes this information for most of this time period (1960 to 1990), but official figures from the 1995 edition of the Statistical Yearbook of Yugoslavia (1991-1994) and the ILO's labor statistics database

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LABORSTA (1995 to 2003) supply unemployment figures for the rest of the relevant years. This final data source is available (as of September 1, 2009) at [laborsta.ilo.org](http://laborsta.ilo.org).

<sup>25</sup> The OECD's Main Economic Indicators (MEI) database can be found on-line at [oberon.sourceoecd.org](http://oberon.sourceoecd.org) (again, as of September 1, 2009).

<sup>26</sup> All of these estimation models suppress the constant term in order to avoid the problem of perfect multicollinearity between the constant term and the country-specific dichotomous variables that would otherwise result (Gujarati, 504, 526-527). In some of the later models that remove the country-specific variables, the constant remains absent in order to preserve comparability across the different kinds of models. Out of an abundance of caution, some of these model variants are run with a constant to see if its suppression makes any difference to the outcomes of the model; in fact, it does not (figures omitted).

<sup>27</sup> Please see Fertig (2001, 713-714) for a more detailed defense of the statistical methodological choices made by this contribution. This analysis did attempt to use the maximum likelihood by GLS estimation technique (Oberhofer and Kmenta; Eliason; G. King) as Fertig does, but this approach was abandoned when the model took too many iterations to converge and created some very strange results (e.g., it posited a statistically significant negative relationship between change in net migration rate and the change in GDP ratio variable). The results of these model runs are available for inspection upon request. It should also be noted that as part of their contribution Boeri and Brücker (2000, 117, ft. 80) utilize seemingly unrelated regression (Zellner) in a peculiar fashion. In particular, they enforce restrictions that make all countries' estimated coefficients the same except for the intercepts.

<sup>28</sup> An early usage of this technique can be found in Dickens and Katz (1987, 69).

<sup>29</sup> Settling on a reasonable population projection for this part of the analysis is difficult in light of the different strategies that are attempted by previous authors. For example, Boeri and Brücker (2000, 122) and Fertig (2001, 717) utilize World Bank estimates of Central and Eastern European population change, while Zaiceva (2006, 33) presumes no population change for her forecasts. Given the uncertainty that surrounds these figures and the developing trends in CEE demography, perhaps assuming a steady-state population for this part of the world is not an unreasonable step to take as a starting point here.

<sup>30</sup> According to Boeri and Brücker (2000, 126), 65.04 percent of the CEEC10 labor migrants who came to the EU15 countries in 1998 shifted economies to Germany. This figure is adopted here because it is the most readily available and consistent such quantity closest to the 2004 CEEC8 accession date in the literature; additionally, there is only limited evidence that this percentage changed very much in the years leading up to CEEC8 accession (Alvarez-Plata et. al., 50-51, 71; Boeri and Brücker 2001, 13; Boeri and Brücker 2005, 11). In order to determine the projected worker migration total to the EU15 countries between 2004 and 2030, therefore, the total number of workers who are forecast to move to Germany during that time in each model is divided by 0.6504. Boeri and Brücker (2000, 126) also provide migrant percentage breakdowns for each of the EU15 member states besides Germany, so it would be theoretically possible to calculate the projected number of migrants for all of these economies. However, this action is not taken in this investigation because it is only interested in treating the EU15 economies as a migration target area as a whole; perhaps a future version of this analysis will take this step.

<sup>31</sup> Over the course of this investigation, it became apparent that using separate employment variables rather than their ratios is more interesting theoretically and allows one to examine a slightly broader array of migration determinants. Therefore, these separate variables are utilized throughout this analysis, even though initial tests of the ratio variable's interactions with the dependent variable demonstrate that it has a significant positive relationship with change in net migration rate. Please keep in mind that employment percentage rather than rate data are used here to avoid altering the sign of these relationships during the migration forecasting process.

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<sup>32</sup> Although one might be persuaded to contend here that absorption capacity really does have a positive relationship with the dependent variable, it is difficult to support that conclusion fully given the correlation of this variable with the German unemployment measure.

<sup>33</sup> In fact, this investigation makes one wonder what role these economic troubles played in the transition to democracy on the part of at least some of the formerly authoritarian Southern European migrant-donor countries. It should also be noted that dropping the regime difference dichotomous variable has no effect on the modified basic model's results (results not shown, but available if necessary).

<sup>34</sup> As shall be seen momentarily, a positive but insignificant relationship is observed between these two ideas if the country-specific variables are removed from the model. It is unclear why taking out these dummies should have this effect on the migrant stock measure's relationship with the dependent variable, but this result strongly tempers one's conclusions about the significance of the relationship between these variables of interest.

<sup>35</sup> Much like Fertig (2001, 715) does in his work, the modified basic model is also run without the GDP ratio variables to determine what effect they have on the overall stability of this model. The outcomes of these calculations demonstrate only minimal changes to the model; in particular, the employment variables become much stronger predictors of changes in net migration but the migrant stock variable loses its significant negative relationship with the dependent variable (results not shown).

<sup>36</sup> Although in various versions of the main model the lagged variables in these pairs are sometimes significant and other times not, there is no other case where the signs become reversed.

<sup>37</sup> Greater regional integration, especially in organizations like the EU that work assiduously to reduce economic disparities between regions, should lead to rising living standards in poorer areas even relative to wealthier locales in the same organization. That increase in wealth, along with increases in employment opportunities and information about them in other countries, could give poorer-region workers greater resources to exploit those opportunities and thus a greater ability to move.

<sup>38</sup> While it is true that there are certain circumstances under which decreasing economic differences among sender and receiver countries caused by economic growth in the former could create increases in migration between them, none of the German-sender countries instances (including the German-CEEC10 case for the projections) should be examples of such a situation. The "migration hump" hypothesis (Martin and Taylor, 105-107; Massey et. al. 1998, 49; Ochoa, 226-227) asserts that a plot of sender-country migration flow over time (assuming constantly increasing economic growth) assumes an inverted-U shape that looks like a camel's hump. At very low levels of economic development, potential migrants do not have sufficient resources to invest in migrating abroad for work. As those incomes grow as a result of development, eventually an increasing number of workers acquire those resources (money, information, language skills, personal connections) and will take advantage of them by migrating out of their home country to find employment. As the economic situation of the sender country improves relative to the receiver economy, however, there are fewer tangible benefits to migrating, so that flow decelerates and may even begin to reverse itself. None of Germany's donor countries in the statistical model, and none of the CEEC10 economies for the projections, are or will be poor enough during the time frames of interest that they should be impacted by this phenomenon. (It should be noted that a similar argument could be made for when a previously closed economy opens to free trade. The idea here is that the economic dislocations caused by the removal of these trade barriers create conditions ripe for increased migration, at least at first. However, as the sender-country economy is strengthened by free trade, that growth eventually reduces the incentives to move below the level present at the time that the trade restrictions were removed [Martin and Taylor, 104-107]. One might be tempted to maintain that the CEEC10 economies would have been in such a situation at the start of their EU accession; however, Martin and Taylor's contention seems to be more applicable to very tightly closed or impoverished Third World economies. The ten CEE accession states had already been exposed to freer, if not completely free, trade with the EU15 member states through their Europe Agreements by 2004 and 2007, and none of them could have been classified as "Third World" countries in those years.)

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<sup>39</sup> A great deal of inertia is present in the net migration flows observed here, a conclusion that can be bolstered by replacing the regular modified basic model dependent variable with net migration rate levels. The massively significant positive relationship between the lagged net migration rate and this new dependent variable discovered in this run illustrates this point quite well (Fertig, 715).

<sup>40</sup> In an attempt to gain a handle on exactly why the unexpected results concerning the GDP ratio variables is taking place here, “replications” of both Fertig’s (2001) and Boeri and Brücker’s (2000) work are attempted. These replications are not identical to what these authors do because the methods utilized in each study are somewhat different from what is attempted here, but the same data, years and variables as these authors employ are included. In both cases, the unusual result of a positive relationship for the change in GDP ratio, but a negative relationship for the lagged GDP ratio, with the dependent variable is observed (results available if desired). Please note that one cannot just remove the 1991 to 1995 Yugoslav data from this model because that action would create an unbalanced panel.

<sup>41</sup> An attempt to recreate this analysis with just post-1990 data fails due to small-N and country-specific dummy variable multicollinearity problems. The guest-worker dichotomous variable is not included in this evaluation since it does not vary in this data set (i.e., no guest-worker programs have been implemented in Germany after 1990).

<sup>42</sup> In particular, the worker repatriation dummy variable is no longer a significant negative predictor of the change in the net migration rate. It should also be noted that the military conflict dummy variable (War Only) does not vary prior to 1991, so it must be omitted from this experiment.

<sup>43</sup> The primary reason why the substantive dummies aside from free movement are not part of this model is that they are not carried over into the projection step of this research (please see the steady-state coefficient calculation portion of this chapter for why that is true). Additionally, some of these dummies, especially the military conflict variable, interact badly with the lagged GDP ratio variable (results available upon request).

<sup>44</sup> Additionally, Alvarez-Plata and her co-authors (2003, 37) determine that various forms of GLS estimators grant about the same predictions of long-run migration stocks in studies much like the one conducted here.

<sup>45</sup> Seven countries’ data from 1960 to 2003 are utilized in these regressions: Greece, Ireland, Italy, Portugal, Spain, Turkey and Yugoslavia. Ireland is included here even though it is not technically a “Southern European” country because its economic circumstances have been similar to those of the other states in this data set. Due to these regressions’ inclusion of lagged and differenced variables, the maximum N for these models is 301.

<sup>46</sup> It should be kept in mind that Human Development Index data for 1990 rather than 2003 are used in the relevant OLS regression in order to keep the operationalization style of this variable consistent (i.e., the HDI values for the last year of the data’s time span are utilized in this fixed-effects regression). Additionally, no HDI coefficients can be employed in any forecasts derived from the regression with no country-specific variables, for obvious reasons.

<sup>47</sup> Although they are not done here, performing similar regressions for the Southern European data would require a few alterations to the independent variable selection and composition. First, the language and border variables would be omitted from them because none of the Southern European states share either of these characteristics with the receiver country. Since no Southern European country has a primary world city in it, the list of relevant secondary (i.e., Milan and Madrid) world cities from Friedmann (1986, 72) would be utilized instead. It should be noted that using the list of primary and secondary world cities for the full-data fixed-effect regressions’ global city dummy does not alter the conclusions drawn by this analysis as to this concept’s utility.

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<sup>48</sup> Even Spain, a country that tried to encourage the repatriation of foreign workers to their original countries during the great recession of the late 2000s, avoided offering such incentives to EU citizens (Donadio and Schwartz).

<sup>49</sup> For instance, the free movement variable becomes a significantly positive predictor of migration rate change when the Yugoslav data are removed from the modified basic model (figures excluded, but available if necessary).

<sup>50</sup> Boeri and Brücker (2000, 124) and Fertig (2001, 718) employ these assumptions for their baseline (medium convergence) scenarios as well.

<sup>51</sup> Please note that no projection utilizing only the Southern European data is performed here for the reasons outlined elsewhere in this discussion.

<sup>52</sup> In fact, in Boeri and Brücker's (2000, 124) low migration incentive forecast, there is a decrease in the overall number of CEEC10 migrants in Germany by 2025.

<sup>53</sup> By contrast, the theoretically unexpected negative coefficient for migrant stock plays very little role in both of these projections' issues. It should be kept in mind that although all of these figures are omitted here, they are available for inspection if necessary.

<sup>54</sup> The model described in Table 3.5 can be estimated with the country-specific variables as well, of course, but if one does so the projection derived from this model's coefficients suffers the same problems as the others that try to introduce time-invariant elements to their forecasts (figures omitted, but available).

<sup>55</sup> In other words, the German employment rate would be ninety percent and the CEEC10 employment rate would be ninety-three percent during the forecast period.

<sup>56</sup> Two projections that are excluded from Table 3.12 vary the population figures to determine the effect that this alteration might have on the projection results. The first utilizes the average value of the 1996-2003 United Nations Developmental Yearbook population changes in each CEE country to forecast their population to 2030. The second one predicts the same values using World Bank (2009) projection data (also available as of December 1, 2009 at [go.worldbank.org/KZHE1CQFA0](http://go.worldbank.org/KZHE1CQFA0)). In neither case do these population projection changes have a marked effect on the overall forecasts of CEEC10 migration (1.34 percent total in the first case, 1.33 percent in the second).

<sup>57</sup> Table 3.3 shows that the lagged German employment variable in the modified basic model is only significant at the 0.10 level in the expected direction.

<sup>58</sup> Additionally, two of the pieces that most influence this work (Boeri and Brücker 2000, 118; Fertig, 714) determine that free worker mobility does positively stimulate worker migration in a significant fashion.

<sup>59</sup> Early evidence concerning this question from the other EU15 member states that permitted CEEC8 workers to freely enter their economies right after their countries' accession also contradicts the welfare tourism hypothesis. The Swedish government reported in 2005 that just one percent of total welfare spending went to nationals of one of the ten 2004 accession countries that year. Additionally, the Irish government stated that fewer than one thousand 2004 accession-state citizens were on their unemployment rolls in March 2006 (Doyle et. al., 12-13). Finally, on the second anniversary of CEEC8 accession, the European Commission (2006, 5) conveyed the argument that there was no great increase in welfare spending by the EU15 governments in the immediate aftermath of that event.

<sup>60</sup> Please note that this latter outcome would be exactly what this analysis' regression model would predict.

<sup>61</sup> It should be kept in mind in this discussion that ironing out social security eligibility and taxation questions is a problem for commuters in the EU as well (Maas, 103-104; Greve and Rydbjerg, 16-22).

## Chapter 4: Systems Models

As discovered in reviewing the literature on CEE worker migration and through hard experience in the last chapter, one's choices of research tools and methodology at the start of an analysis in this area can lead to quite different expectations of post-accession worker movement. It may therefore be advisable to utilize multiple analytical methods to arrive at any final conclusions about the magnitude and consequence of this phenomenon. That goal, which can be accomplished here by employing an underutilized technique called systems modeling, is the paramount objective of this chapter. Before attempting to fulfill that ambition, however, the provision of some background information about systems modeling is necessary since it is not a familiar technique for most political scientists. Once that detailed material is presented, the specifications for the baseline systems model are explicated, including any new relationships or data sources that are necessary to construct this model. The outcomes of the baseline model and the alternative versions of that model follow this step, along with careful testing to ensure that its results are plausible, not overly dependent on any particular assumption or variable within it, and able to withstand difficult conditions. Finally, a brief discussion of the importance of these results in light of the product of the statistical models described in the previous chapter is imparted. These techniques should prove to be complimentary to one another and permit a deeper understanding of the dynamics and consequences of CEE worker migration.

### **Systems Thinking and Systems Modeling:**

Succinctly put, systems modeling<sup>1</sup> is a computational methodological tool that can be used to investigate the dynamics of complex systems and that features an

interdisciplinary approach to problems grounded in a complicated reality (Klir; Laszlo; Mesarović; Skyttner; Weinberg). Systems modeling borrows from a number of academic traditions, including mathematics and engineering (for their theories of non-linear dynamics and feedback control, respectively) as well as the social and behavioral sciences. Systems modeling is also designed to illustrate the utility of systems thinking, the philosophy that the real world must be understood holistically rather than in a piecemeal fashion (Sterman 2000, 4-5). Thus, for many systems modelers (Clark and Cole, 41-43; Sterman 2007, 90), systems thinking is a paradigm (Kuhn) that influences, in the most fundamental possible ways, how they perceive the social, economic or natural worlds that they are trying to understand.

*History and Uses of Systems Modeling*--The development of systems theory, the formal or mathematical expression of systems thinking principles, started just before World War II (Klir, 97-98). However, the appearance of biologist Ludwig von Bertalanffy's article (1950) on closed and open systems is generally considered to be the origin point<sup>2</sup> of the attempt to form a general systems theory<sup>3</sup> across the various scientific disciplines.

Systems engineering and operations research, the study of design principles and problems respectively, soon developed<sup>4</sup> out of this desire for a general systems theory (Klir, 101-102). These disciplines eventually attracted the attention of the American federal government, which began funding large-scale model-building projects for their military and space programs, among others (Clark and Cole, 4-5). Between the 1950s and 1970s, there was considerable intellectual excitement surrounding the idea of creating a general systems theory; many academics were attracted to this subject by the promises of the fruits of multidisciplinary work and by the idea of unifying the many fields of the natural

and social sciences<sup>5</sup> (Ackoff, 52-53, 56-59). However, the researcher who probably did the most to popularize the study of system dynamics in the management and social sciences is Jay Forrester (1975). His application of these principles to the business world (Forrester 1958) and the study of how cities grow, thrive and decay (Forrester 1969) are milestones in the development of system dynamics. The work that gained him and system dynamics the most public notoriety, however, is the Club of Rome project (Forrester 1973; Meadows et. al. 1972) that predicts widespread natural resource shortages and overpopulation problems in the world's medium to long-term future. The resulting political and cultural firestorms related to these publications (Forrester 1973, vii-viii) and their attendant criticisms (Hoos, 236-237), along with the failure of many of the predictions of Meadows et. al.'s (1972) volume<sup>6</sup> to come true, removed some of the sheen from system dynamics. However, as Sterman (2007, 90) argues, system dynamics remains a vibrant field of study today, with its ideas penetrating even elementary school pedagogy and the realm of video games.

Although it is interesting to consider that the utility of system dynamics goes beyond the walls of academia, what is more important at present is to remark upon how systems modeling and system dynamics are employed in research areas that are of interest to this study. International relations scholars (Choucri; Skyttner, 100-104), especially peace and conflict studies researchers (Boulding 1978; Mesjasz; Kamiya and Wils; Hoover and Kowalewski), find that system dynamics and the systems modeling approach are helpful in addressing a number of different questions about the political world. Additionally, a few demographers (Bongaarts and O'Neill; van de Walle and Knodel; de Cooman et. al.; Rosero-Bixby and Casterline) and public policy analysts

(Cavana and Clifford) are able to employ system dynamics to gain greater insights into their research interests. However, relatively few past scholars apply these ideas to migration<sup>7</sup> or immigration matters (Öberg, 39-40). For instance, Mabogunje (1972) utilizes system dynamics principles in examining West African migration patterns to create something that might be called the “migration system” concept (Mabogunje 1970, 3-4; Bonifazi, 123). Feedback effects, self-regulation, and the circularity of migration are all inherently captured in Mabogunje’s portrait of this issue in this part of the globe (Öberg, 39). Pryor (1981, 122-123) describes a few attempts from the 1970s at employing system dynamics to examine labor migration from the former Yugoslavia to Western Europe. Finally, Richmond and Verma (1978) devise a prolegomenon for a global systems model that accounts for both international and domestic migration. Designing such a model compels them to compare neo-classical economic or sociological theories of migration with Marxist views on migration, and they find that none of them grant scholars a complete picture of this concept. However, Pryor (1981, 123) declares that Richmond and his co-author are too ambitious in their piece and encourages them to ground their work in a smaller, real-world migration system.

*Critiques of Systems Modeling*--This mild criticism of the Richmond and Verma article pales in comparison to some of the opprobrium that has been heaped upon system dynamics from some quarters over the years, however. This turn of events is partly due to some of the near-fantastical claims that are made about this idea by some early researchers into general systems theory. Even some of the founders of the field (Boulding 1964, 29-34; Rapoport) explicitly caution system dynamics scholars against becoming carried away with promises about what systems modeling could accomplish. Another

reason why some scholars are disenchanted with systems modeling is that it has developed a reputation among some critics for being too “touchy-feely”<sup>8</sup> to be a serious method. Especially given the difficulties discussed below that systems modelers have with confirming their results, any indication that a tool is not as exacting as it should be would count as a strike against it in many practitioners’ minds. That contention is particularly true in a discipline like political science that has tried for a long time to become more methodologically rigorous. Finally, systems modeling gained much public attention when it was utilized during the Club of Rome project<sup>9</sup> in the early 1970s. The infamous difficulties and political uproar associated with the results of that endeavor turned many politicians, policy analysts, government officials and academics away from this technique.

However, the scholar who makes the most sustained and thorough critique of systems analysis<sup>10</sup> is Hoos (1983). She censures both the theories behind systems analysis and the results of projects that use it, going on to assert that its methods are too politicized and thus avoid unfavorable scrutiny (Hoos, 15-27, 67-85). The author continues her condemnation by declaring that systems analysis often employs techniques out of their appropriate contexts, a phenomenon she refers to a “cargo cult” mentality (Hoos, 81). She directly confronts what she calls the “Panglossian” aura (Hoos, 25) that surrounds systems engineering, maintaining that this method cannot claim unqualified successes even when it is applied properly in its correct sphere. In short, Hoos’ book is a devastating indictment of systems analysis and all of its derivative methods and fields of study. However, this analysis still maintains that systems modeling can be used prudently

in this research to create a better understanding of the politics of labor migration within the European Union.

*Systems Thinking Principles*--Now that an examination of the history of systems modeling is complete, one can turn full attention to the five fundamental principles<sup>11</sup> of systems thinking: openness, purposefulness, multidimensionality, emergent properties, and counterintuitiveness (Gharajedaghi, 29-55). The notion of openness is that the world is composed of permeable sets of relationships that can only be truly understood in their wider, holistic context rather than in isolation from one another. In other words, systems thinking encourages people to intently examine the widest possible picture of the phenomena that they are interested in studying (Richmond, 113; Gharajedaghi, 30-32; Sterman 2000, 861-862). Purposefulness implies that there are reasons why systems (and the individuals within systems) behave as they do. It is up to the investigator to learn what motivates people in different settings and then incorporate those motives into the design of their models. Although rational (self-interested) choice is a significant part of purposefulness, systems thinking also recognizes that other kinds of choices and constraints matter as well (Gharajedaghi, 33-36). One of the most powerful principles behind systems thinking is multidimensionality, which is the ability to detect complementary relationships in apparently divergent tendencies and construct workable systemic explanations from seemingly incompatible parts of competing theories (Gharajedaghi, 38-44). Taking this principle into account also allows individuals to appreciate a plurality of functions, structures and processes that may surround and permeate their ideas much more easily than a dichotomous perspective would tolerate. A multidimensional perspective also permits systems modelers to see beyond the

constraints that dichotomous relationships and zero-sum games may place on many analysts' conceptions of social problems and their solutions.

Another important foundational concept of systems modeling is that of emergent properties, which are characteristics of a system that organically arise from it but do not exist in any one particular part of it. They are present because of the interactions of multiple individuals or sub-systems but cannot be located using a reductionist point of view (Gharajedaghi, 45-47). For example, human life itself (or perhaps consciousness of human life) is an emergent property; in order for it to exist, all of the critical systems in a human body must be functioning properly and working together to maintain it. However, life does not exist in any one part of the body since if one removed a vital organ<sup>12</sup> from a person, her life would disappear. An appreciation for emergent properties in systems thinking can allow those who practice it an enhanced ability to model how large systems actually behave in the real world. That perspective may also open up their studies to more holistic and interesting questions than are available to those who do not fully embrace these principles.

Finally, systems thinking emphasizes counterintuitiveness, or the realization that systems and individuals often do not react to incentives and stimuli in the way that one might expect at the outset. This behavior may sometimes create unintended consequences, or at least results that are quite surprising to an outside observer or an initiator within the system. This property of systems thinking is strongly related to emergent properties; since it is generally difficult to observe or measure the latter in isolation, it is quite easy to mistakenly believe that some particular action should have a desired effect when in fact an emergent property of the system can frustrate that aim. In

any event, the idea of counterintuitiveness covers a number of observations about cause and effect in real-world systems that are important to any study of human societies or behavior (Gharajedaghi, 48-50; Richmond, 22-28). Cause and effect may be separated by time and space, one cause may have many effects, and inertia may play a determinative role in how a system behaves. Systems thinking's explicit recognition of these features of reality can allow it to systematically include counterintuitive results in its models and illuminate a broader understanding of the behavior under examination.

*Basics of Systems Modeling*--In order to put these principles of systems thinking into action and enhance their ability to study a host of interesting biological, physical, social, managerial and economic phenomena, systems modelers have created a set of mathematical tools based on non-linear dynamics. These techniques require systems modelers to categorize the items they want to examine into three groups: stocks, flows and converters (Gharajedaghi, 59-64; Sterman 2000, 191-210; Richmond, 35-41, 56-59). Stocks<sup>13</sup> are accumulations of money, people, objects or other characteristics that a researcher is interested in examining; if one could speak of a "grammar" of systems modeling, stocks are the "nouns" of that analogy. Because they are collections of the items of interest, stocks describe the condition of a system at any specific moment, provide systems with memory and inertia, and are the sources of delays in those systems. They are normally represented in stock and flow diagrams as rectangles labeled with the name of the stock in question and, ideally, the units in which the stock is measured.

Flows measure the movement of physical and incorporeal objects into and out of stocks at any particular point in time; they are the "verbs" of systems modeling because they describe activities or items in motion. They are generally signified in stock and flow

diagrams as thick arrows or pipes with valve-shaped symbols representing how those inflows and outflows are regulated going into and out of stocks. More generally, the rate of change of a stock is the net flow into or out of it; these changes occur in an infinitesimal amount of time so that they may be mathematically integrated over time into the values of a stock. Converters<sup>14</sup> help to determine flow rates as exogenous constants or endogenous variables that influence the speed with which objects enter or leave stocks. In terms of the grammar analogy used earlier, converters are “adverbs”<sup>15</sup> because they influence how quickly or slowly money, people, skills or other objects move into or out of stocks. Converters are generally represented in systems modeling diagrams as circles with thin arrows directed at the flow valves that they are influencing.

Population growth and movement can be conveniently conceptualized and represented in these systems modeling terms. Every country has a number of people who live within its borders and who are migrants in it (stocks), but those figures are not constant over time. The net changes in state population or migrant stocks (flows) are impacted by the health and wealth of these populations, whether a war or virulent disease is present in that country, and by a host of other external and internal conditions (converters). Although sometimes policymakers are interested in the value of these population stocks at any one time so they can provide various services to them, generally they want to know the rate at which they are changing and what those stocks’ figures may be in the future. Again, systems modeling grants policymakers the ability to comprehend the dynamics of their country’s demographics that led to the present situation, estimate future values of population-related data, and design effective responses to problems that may arise from domestic and cross-border population shifts.

*Systems Modeling Procedures*--Systems modeling research proceeds much like any other such endeavor in the social sciences, and its process<sup>16</sup> can be broken down into five distinct phases (Sterman 2000, 85-104). The first issue that must be handled is problem articulation, or setting the external boundaries of the study. Although systems thinking encourages examining social and economic problems from a holistic perspective, limits must be placed on the incipient model in order to prevent unworkable, unwieldy and confusing products from being created. This step includes determining the problem one wants to explore, establishing the key variables that might be useful in addressing that problem, and selecting the time horizon for the investigation. The second matter that must be attended to is formulating the dynamic hypotheses that guide the study. These hypotheses are based on competing and complementary explanatory theories of the problem, but with a special focus on potential endogenous feedback structures that may affect the subject of the research. An important part of this stage is mapping the causal structures that underlie the initial hypotheses using a number of diagrams, including causal loop diagrams and stock and flow maps.

Third, the systems modeling process insists that a researcher formulate her model by carefully specifying its structure, estimating its parameters and initial conditions, and testing it to see if it addresses the puzzle it is designed to examine. For some researchers, this step may mean tediously writing out the equations that comprise the model with all of the attendant mistakes that act might create. However, with modern systems modeling software<sup>17</sup> like STELLA, the relationships can be specified using stock and flow diagrams instead. The program then automatically converts those diagrams into the equations they represent and checks to ensure that many basic mistakes (such as creating

circular relationships) are not committed. In the fourth step, valid data are entered into the model, results are estimated, and the model is tested in a number of ways to ensure its reliability. These tests often include reproducing historical trends using known data patterns and verifying that the model is robust even when subjected to extreme data conditions. The basic purpose of these tests is to be certain that there are no serious flaws in the model that would compromise the results that are derived from it. Finally, these results are translated into policy design and evaluation in the fifth and final stage of the systems modeling procedure. This step includes determining strategies and rules that might be applied in the real world and examining whether some of these strategies might interact well with one another to create synergistic results. In conclusion, this process is implicitly followed in this chapter to investigate interesting policy questions surrounding EU internal labor migration.

*Advantages of Systems Modeling*--Although the mechanics and theory behind systems modeling are interesting topics, a more pressing question to discuss here is what this procedure can and cannot do in social science research. One important benefit of systems modeling is that it effortlessly incorporates feedback relationships between variables, a fundamental principle of systems thinking, into its modeling process (Richmond, 17-21, 61-72; Sterman 2000, 12-14). Many of the most interesting real-world relationships and phenomena are not linear and unidirectional, and systems thinking recognizes that in its modeling by overtly encouraging researchers to take those features into account. In fact, many system dynamics are created by the presence and interaction of self-reinforcing (positive) or self-balancing (negative) loops. Self-reinforcing loops create the familiar exponential growth that anyone who has studied arms races or bacterial growth in a food-

rich environment understands implicitly. However, no quantity can grow exponentially forever; resources are finite, and so expansion is naturally limited by balancing loop processes. In terms of labor migration, the arrival of foreign workers into a new, wealthier economy creates the potential for both self-reinforcing and balancing loops to develop. Migration between these two countries might be bolstered by the networking effects that make it easier for compatriot workers to leave home for the new economy. However, the growth of their presence may reduce the number of available jobs for later migrants and can engender a negative political and social backlash among native workers that would make the receiver economy less inviting for newer arrivals. In other words, scholars' appreciation of labor migration is truncated without the idea of feedback somewhere in their mental models of it.

Another benefit of systems modeling is that it can encourage the discovery of unexpected relationships in the systems under study, and thus the creation of new hypotheses involving the variables in question. It may even suggest new combinations and interactions of variables that would be worthy of further examination. These features of systems modeling arise directly from the systems thinking principles of emergent properties and counterintuitiveness (Sterman 2000, 5-10, 37-38; Gharajedaghi, 45-51). The former idea implies that some relationships and variables cannot be perceived as being in existence or important<sup>18</sup> until a more holistic view of the system under investigation is taken. These emergent properties are often what make certain behaviors counterintuitive and initial predictions wildly inaccurate, a difficulty that this study is aware of in its explorations of the dynamics of intra-EU labor mobility.

A final positive point to be made about systems modeling, at least as it is done using a program like STELLA, is that its visual nature makes it easier for non-technical users of these models to understand what their logic is (Sterman 2000, 193-195; Richmond, 116-120; Grafton and Permaloff 1995, 503-504; Grafton and Permaloff 1989, 254-255). Mathematical equations can be imposing and confusing to the uninitiated, and even for experts they can be less than intuitive. Stock and flow diagrams remove this barrier from consideration, even though beneath those depictions lie some complicated mathematical relationships that the computer can more easily handle than any human could. In order for systems thinking to gain the widest possible audience, it should be user-friendly and approachable. Visual representations in systems modeling like stock and flow diagrams, causal loop diagrams, and user-monitored “dashboards” (gauges, charts and graphs that show how variables are behaving and have behaved within a model run) may allow that goal to be achieved remarkably well.

*Constraints of Systems Modeling*--Even though there are many advantages of systems modeling that might make it useful to various social scientific analyses, there are also some limitations on what it can do that are important to appreciate from the outset. The first of these constraints is related to the more general problem of prediction and extrapolation from present data trends. When a systems model is utilized to forecast the future behavior of a system under different sets of conditions as is attempted in this study, one can never be certain<sup>19</sup> that the results of the work are correct. All one can do is examine how the system behaves in the past and try to replicate that performance using historical data and the model in question (Sterman 2000, 874-880; Clark and Cole, 65-68). This strategy at least allows one to make a defensible case that the future behavior of

the system will unfold as the model predicts. The validity of this argument is sensitive to the model's assumptions, naturally, but one can test the robustness of the model's results using a number of extreme case and sensitivity analyses (Ford and Flynn, 276-278; Sterman 2000, 869-871, 882-887; Richmond, 149-151). These steps can help deflect some, although not all (Hoos, 224, 237-238), criticism that a model's results originate solely from the initial assumptions of, and data used in, that model.

A second limitation of systems modeling is derived from its inherently non-linear, non-positivist nature. As Sterman (2000, 846-850) states, models can never be verified or validated because, as simplified visions of reality, they are all "wrong"<sup>20</sup> at some level. However, even beyond that observation, systems models face an extra barrier to acceptance because they can rarely be supported by commonly accepted statistical<sup>21</sup> tests. Although there have been some encouraging developments concerning this issue in recent years (Dogan), it is still difficult to perform hypothesis testing and calculate confidence intervals for systems models' parameters. This feature is perhaps what most distinguishes systems models from econometric or statistical models of the same phenomena and is one reason why the former are oftentimes used in conjunction with the latter in the same study. The complementarity of these techniques (Gurian, 118-119) implies that the results of systems models can be used to further develop statistical models, and the results of statistical research can inform the construction of systems models. In fact, information from past statistical models is utilized in this study to build its systems models.

*Systems Modeling's Suitability for this Study*--Worker migration within the EU, the incentives that create it, and the barriers that prevent it comprise a complex system of

feedback loops and stocks and flows of people, and would thus seem to be a natural subject for systems modeling to address. This observation is especially resonant when one knows that the current work is inspired by a systems model that was constructed by the author and other co-workers (Bickers) to explore workforce movement and development in the state of Indiana. Although systems modeling is employed frequently in business<sup>22</sup> and management research, the natural sciences, and environmental science (Forrester 1975; Sterman 2000, 42-55, 66-79; Gharajedaghi, 190-264), it is not applied in political science<sup>23</sup> or public policy studies very often presently (Cavana and Clifford). One aim of this study is thus to add to these sparse contemporary applications using a topic that appears to be tailor-made for the strengths of this technique.

Additionally, systems modeling is especially appropriate for an analysis of labor migration because the stock and flow models can implicitly assume net worker flow. As a reminder, the unit of flow measurement adopted by the statistical models is population-adjusted net annual labor migration rather than gross worker movement. An implication of this decision is that workers who leave short-term or seasonal jobs abroad and return home simply shift back into their home population stock and thus do not count in that year's donor-country outflow. Generally, publics and politicians care more about workers who move permanently into their countries than temporary employees because the former are perceived to create lasting changes in a society's demographics and labor market. The same statement could be made about cross-border commuters, small-scale traders (Okólski, 117-118) and other workers who have no intention of settling down in the country where they are temporarily engaged. This expectation is not unreasonable, of course, as questions of identity rarely revolve around temporary "visitors" to a country or

region. Earlier studies (e.g., Fertig, 712) make much of their focus on “permanent” migration, but using net flows is also an outgrowth of the available data and the logic of systems modeling.

However, systems modeling also allows researchers to examine the effects of gross migration flows<sup>24</sup> on a society and its policies for dealing with both types of migration. Once again, the impacts of net and gross migration on the politics of both sender and receiver countries can be quite disparate from one another. One can easily imagine a scenario in which large-scale gross immigration and emigration are taking place between two countries, leaving only a small residual net migration in their wake. Although one would predict based on that inconsequential net migration that neither country’s economy or politics are being strongly influenced by the labor migration between them, the sheer quantity of two-way worker movement may create enormous political pressures in both states<sup>25</sup> to decelerate that flow. In other words, the sheer volume of migration a country experiences may matter as much as the net outcome of that process due to the disconcerting cultural and political effects of large-scale permanent, or temporary, labor migration. Even if one could confidently predict that the long-term permanent volume of migration to a country would be low, a sudden influx of foreign workers arriving in an economy right after the introduction of a new labor mobility policy could create serious disequilibria in the politics and economy<sup>26</sup> of both the sender and receiver country. Although the structural design of the systems modeling software does permit one to trace both gross and net migration at the same time, for technical and theoretical reasons<sup>27</sup> this study limits itself to examining the determinants and consequences of CEEC10 net migration exclusively.

### **Model Building:**

An early phase in the systems model construction process (Richmond, 17-22, 141-153) involves setting the boundaries of the problem under study and determining the relevant variables in that system. An interesting way of visualizing that process is to construct a causal loop diagram containing the system's variables of interest; the one that represents the current systems model can be located in Figure 4.1. Many of the interactions between these variables, including their directions and polarities, should be familiar given the results of the statistical model in the previous chapter. For instance, an increase in the GDP ratio difference between the migrant receiver and sender countries should lead to an increase in the migration rate and thus the number of net worker migrants shifting locations, while an increase in donor-country employment should generate a decrease<sup>28</sup> in the number of net CEEC10 migrants. However, the causal loop diagram includes many relationships that are not present in the statistical model and illustrates loop structures<sup>29</sup> and feedback that statistical modeling does not permit. It is the goal of the next section of this discussion to elucidate, defend and operationalize these new relationships. It should be noted that the causal loop diagram outlines a rather simplified model of the migration system that exists between the CEEC10 and EU15 member states. In fact, a subsequent portion of this section explicates potential relationships between these variables that are not included here for various reasons. Hopefully, even this relatively uncomplicated model of the CEEC10-EU15 migration system should generate helpful insights as to how it behaves, however. Finally, this model-building explication concludes with a brief test of the model's predictive ability utilizing CEEC10 data from the late 1990s and early 2000s.

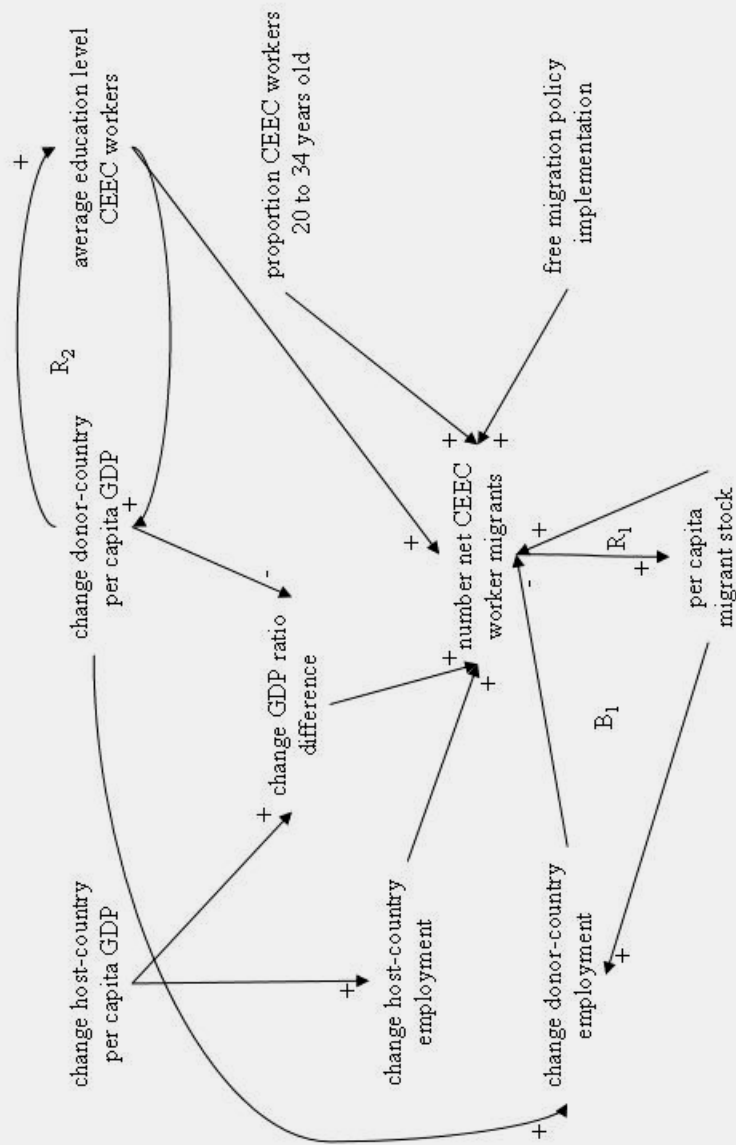


Figure 4.1: Causal Loop Diagram of Systems Models (Note: R = reinforcing loop; B = balancing loop)

*New Relationships*--Perhaps the easiest of the new interactions<sup>30</sup> to explain and support in this section are the ones between both host and donor country GDP and employment. Standard economic theory would contend that increasing per capita GDP would also augment employment because an expanding economy allows more workers to be hired and requires them to be in jobs in order to produce the goods and services that further enhance per capita gross domestic product. However, teasing out the exact value of the statistical relationship between increases of GDP and employment in isolation from all of the other factors that influence these entities is extremely difficult. The customary reaction to this situation would be to exclude this connection from a model because there can be little statistical confidence in the number that is utilized to quantify this relationship. However, according to Forrester (1961, 57; cited in Sterman 2000, 854), this action is tantamount to claiming that there is no relationship at all between two such variables, a claim that is almost certainly false. Therefore, an alternative appropriate action might be to estimate such parameters as carefully as possible and rigorously test the validity of these estimations through the use of sensitivity analyses and data replication using historical information. Although this choice may be contentious, it is the one made by this study in order to gain an enhanced perspective on the CEEC10-EU15 migration system and illustrate the potential value of systems modeling more generally<sup>31</sup>. With these caveats firmly in mind, this study estimates that a one-percent increase in (sender or recipient-country) GDP creates, all else equal, a 0.01 percent increase<sup>32</sup> in (donor or host-country) employment. This estimate<sup>33</sup> is based on the author's understanding of how these two factors interact with one another and the limitations<sup>34</sup> of

this systems model; it is also quite conservative and could be easily changed in the future if it turns out to be faulty in any way.

Another set of relationships that must be discussed here involves the ones concerning migrant stock, including the observation that these new interactions create a reinforcing and a balancing loop in the model. The first new connection, the one between net CEEC worker migrants and per capita migrant stock, is simply an open recognition of something that is unstated in the statistical model. In particular, an increase in the number of CEEC migrants also increases the per capita stock<sup>35</sup> of those workers in the receiver country. That observation is not particularly noteworthy, but at least one of its implications might be; if network theory is correct, and there is only limited evidence in its favor from the statistical model, that growth in per capita migrant stock should then generate an increase in the number of future migrants who arrive in the receiver country. The explicit recognition of the relationship between these variables indicates that a reinforcing loop structure exists between these two variables in the model. This loop is implied in the theoretical structure of the statistical model, but the systems model's construction allows it to be recognized overtly. The next relationship involving per capita migrant stock is not as obvious as the previous one and therefore requires a bit more explication and defense. Logic and classical economic theory would contend that, leaving out other influences on this relationship, the per capita migrant stock variable should have a positive association with sender-country employment. That statement can be made because an increase in a country's workers moving abroad to take jobs should reduce donor-country unemployment (increase employment) since there are now fewer competitors for positions in the sender country. Even if employed workers were to leave

the sender for the receiver country, those migrants must now be replaced, most likely by donor-country unemployed workers. The causal loop diagram indicates that the addition of this relationship creates a balancing loop in the model: an increase in the number of worker migrants augments the per capita migrant stock, which then increases host-country employment and decreases the number of workers who migrate. In fact, the recognition of this balancing loop may indicate one reason why fewer workers often migrate than one might initially suppose (i.e., there is an integrated regulator in the system that retards the migration process). Using all of the operationalization qualifications described previously, this research estimates that, all else kept constant, a 0.01 (one-percent) increase in per capita donor-country migrant stock creates a 0.01 percent increase<sup>36</sup> in donor-country employment. Once again, this estimation is a fairly conservative one and can be altered if future investigation demonstrates that this figure is too high or too low.

The three new relationships involving education level, itself a new variable in this analysis, remain to be explicated and justified. The average number of years of education variable is calculated for the ten CEE countries' workers<sup>37</sup> from United Nations-collected data on the highest educational attainment by adults over the age of twenty-five (UNESCO Institute for Statistics, 172-173). The first relationship that utilizes this variable is the one that directly links education level and migration rate. The guiding presumption of this association is that CEE workers with greater accumulations of skills and education are more likely to move to the EU15 economies because they can generally realize greater gains from those skills in a wealthier economy (Harris and Todaro). Additionally, CEE workers with more education are more likely to have knowledge of

languages, job markets and contacts in their receiver country than those with less education. This deduction is also inspired by the “brain drain” hypothesis (Straubhaar and Wolburg, 1-2; Favell et. al., 11-12) that has so concerned policymakers in Central Europe and elsewhere across the globe<sup>38</sup> over the past few decades. Operationalizing this relationship is somewhat complex, however, because one does not want to imply that all educational gains are equal. For instance, a group of workers with only a primary education may be more likely to move if they complete another year of education on average, but they are still unlikely to move overall because they have a relatively low amount of skills. A similar statement could be made about a group of potential migrants who have already completed a tertiary education, but they are more likely to migrate anyway because they have a large bank of skills at hand. Therefore, it is reasonable to operationalize the relationships that employ education as their base with an inflection or break point at which the effect of the education variable transitions from being a negative influence on the migration rate to having a positive influence on that rate. This analysis estimates that this null effect point is at twelve years<sup>39</sup> of average education, which is equal to completing an upper secondary-level course of study. The particular operationalization that is utilized for this relationship is that, *ceteris paribus*, for every year of average education that a CEE country’s workforce possesses, the members of that workforce are more likely to migrate by a factor of  $1 \times 10^{-6}$ . Although that figure<sup>40</sup> may seem unusually tiny, it is important to keep in mind that the average migration rate calculated during the statistical modeling-based forecasts is roughly  $3 \times 10^{-4}$ . While the initial estimation of this effect is fairly cautious, one can see that it could have a

considerable positive impact on a highly-educated society's migration rate over the course of many years.

The remaining two interactions involving the average education level variable are also the ones that comprise the second reinforcing loop in the systems model. Increases in education level should independently augment sender-country GDP because workers with more skills are assumed to be more productive than low-skill workers. However, the separate effect of education on GDP is likely to be quite small here due to the considerable delays and decays that exist in transforming recently-acquired education into practical workplace skills. In other words, educational improvements do not automatically translate into workforce improvements; skills must be practiced in reality before they can become effective, and some expertise acquired in an academic setting may not be appropriate for certain working environments. Therefore, this analysis estimates that enhancements to a donor-country's average education level have a very small, 0.1 percent (0.001) per year of improvement, effect on donor-country GDP. Please note that this variable is operationalized as the average education level-migration rate one is in that countries with an average education level above twelve years experience a positive effect<sup>41</sup> of this function on their GDP while those with an education level below twelve years encounter a negative consequence for their GDP. Enhancements to per capita GDP are also expected to have a positive impact on education levels, which is the source of the second reinforcing loop illustrated in the causal loop diagram. The operational notion here is that as per capita GDP increases, there are more resources for the government and private individuals to spend on education and a reduced likelihood that students would need to leave school early for reasons of financial hardship. Once

again, however, the discrete effect of GDP on education level is likely to be slight because increases in per capita GDP would give governments and individuals the ability to expend resources on policy goods aside from education as well, and there are almost certainly going to be delays and “leaks” in the pipeline connecting GDP and education level growth. In other words, each year these resource enhancements can assist only a small fraction of a country’s students to finish a program of study or extra year of education who otherwise would not complete that training. Therefore, this analysis estimates that every one percent increase in donor-country per capita GDP creates an improvement in the donor-country education level by 0.001 average years of education. As has been stated for the previous new relationships, the values associated with these two associations are fairly conservative and are open to change as later circumstances warrant.

Another new variable of interest is related to a demographic factor that can certainly be contended to have an impact on the migration relationship between sender and host countries. Cumulative causation migration theory (Massey et. al., 47-49) contends that younger people are much more likely to move to find work than older potential employees are. Countries with a greater proportion of their population in the age bracket that is most likely to move would therefore be presumed to have higher migration rates<sup>42</sup> than those with smaller proportions of their populations in the relevant age range. However, just like with the education variable, not all changes in the proportion of workers in the relevant age range are equivalent. For instance, a country with a very low share of its population in the twenty to thirty-four age bracket<sup>43</sup> that expands that figure would have a higher migration rate, but the total effect of this low fraction of young

workers in the population on the migration rate would likely be negative. A similar statement could be made for a society that had a fairly large percentage of workers in the relevant age range; a decrease in that proportion would reduce the overall migration rate, but the complete impact of this high fraction of such workers on the migration rate would probably remain positive. Therefore, the operationalization of this association proceeds in a fashion similar to that of the education relationships. The break point between an overall positive and negative effect of the age range variable on migration rate is estimated to be twenty percent, and for every one percent (0.01) increase in the proportion of the donor-country's twenty to thirty-four year old population, the migration rate increases independently by a factor of  $1 \times 10^{-6}$ . Once again, this alteration<sup>44</sup> is a relatively small one because other factors impact this relationship, but it can be adjusted as more information is gathered about this phenomenon. Additionally, one can perceive how this factor might have a considerable cumulative impact on the migration rate over many years. The initial values of the percentages of the CEEC10 populations in the appropriate age range are calculated from the 2005 figures<sup>45</sup> located in World Bank (2009).

Each CEE country's young worker proportion stock is not the only variable that must be operationalized in this discussion, however. For instance, because this analysis takes population changes into account as part of its baseline model, it is sensible to incorporate such alterations involving young worker proportion into it as well. The average rate of change<sup>46</sup> in the young worker population proportion for each of the ten countries under study in this analysis is calculated from the figures available in World Bank (2009). The presence of these population proportions in the systems model may

also allow this study to make forecasts about the composition of the CEEC10-EU15 migration flow as well as its overall magnitude. That assertion might be true because recent examinations of post-accession CEEC10 worker flows (Brücker and Damelang, 31-32; Pollard et. al., 25) indicate that large portions of those workers<sup>47</sup> are in the twenty to thirty-four age category. One could use the information provided by these studies to create a dimensionless multiplier called “age disproportionate factor” to estimate the portion and magnitude of future worker flows<sup>48</sup> from each CEEC10 economy that fall into the relevant age bracket. Based on the studies cited earlier in this paragraph, the value of this factor is initially approximated to be three. This converter can then be multiplied by the annual age bracket percentage value to estimate the proportion of yearly worker migrants that lies in this category; the magnitude of the annual young worker flow can then be determined by multiplying this resultant by the yearly net donor-country migrants figure. The starting value of the age disproportionate factor is only a first estimate and is certainly open to change if later data acquisition suggests that another value would be better.

Another descriptive feature of the CEEC10 worker migrant flow that might be interesting to forecast, and the one that contains the final two new relationships that must be explicated in this section, is the proportion of those sender-country workers who possess a college degree. This concept does not appear in the causal loop diagram because its value is excluded from the calculation of each country’s annual net migration rate. However, it may still be worthwhile to try to understand what this figure could be like in the future so EU15 governments might know what to possibly expect on this score. The initial stock data<sup>49</sup> for this measure are taken from Brücker and Damelang

(2009, 42), but they are problematic<sup>50</sup> because these figures are for the percentage of the CEEC10 working-age migrant population rather than that entire population. That fact implies that one cannot calculate the number of college-educated migrants in an analogous way<sup>51</sup> to how one is able to project the number of young worker migrants described earlier. In other words, the results section of this analysis can only report the final percentage values that these country-specific variables take. This analysis presumes that changes in sender and host-country GDP affect the proportion of the (working-age) migrants who have college educations in a mirror-image fashion. Since a growing receiver economy would be likely to disproportionately attract college-educated migrants from the sender countries because they would have a greater pool of skills to draw upon to take advantage of the opportunities presented by the expanding economy, this analysis posits a positive relationship between receiver-country GDP growth and the percentage of college-educated migrants who come to that host country. In particular, every one-percent (0.01) increase in German per capita GDP is estimated to independently create a 0.05 percent (0.0005) boost in the proportion of donor-country migrants<sup>52</sup> with a college education. The relationship between sender-country GDP and the percentage of its migrants with college educations is similar in form except that a negative relationship is anticipated here because a growing sender-country economy should persuade potential college-educated migrants to become employed in their home economies. Specifically, every one-percent expansion in donor-country GDP is expected to create a 0.05 percent decrease in the percentage of college-educated migrants who leave for the receiver country. Both of these relationships are rather modest in their expectations of effects on the proportion of college-educated migrants in the relevant flows but, like the previous

new relationships, they are open to alteration if necessary and could have considerable effects on the value of this stock in the long run.

*Omitted Relationships*--Although the above new relationships may seem to exhaust the possibilities presented by the causal loop diagram, they do not come close to their end. Quite a few other relationships might be hypothesized based on that drawing, the first set of which contains the connections that could be depicted from sender and host-country employment change to sender and host-country per capita GDP change, respectively. A reasonable classical economics argument could be made that an increase in employment might augment per capita GDP in much the same way that a rise in the latter stimulates an increase in the former. However, since both of these notions describe changes in these variables, attempting to include both sets of directional relationships in this model would create simultaneity issues (circular relationships) that the modeling software refuses<sup>53</sup> to permit. Since per capita GDP increases would seem to have a greater impact on changes in employment rather than the other way around and because employment increases often lag GDP increases, only the former relationship is included in this systems model.

Another variable that could affect both receiver and sender-country GDP levels is the number of net worker migrants who leave the CEE economies for the EU15 countries. One could certainly assert that an enhancement in net migration would increase the per capita host-country GDP and decrease the receiver-country's per capita GDP because productive workers are being transferred from one economy to another in this relationship. However, the total consequences of this migration may depend quite heavily on the types of jobs that these migrants take in their host-country economies, especially since the variable in question here is per capita GDP change. For instance, if the brain

drain effect pulls CEEC10 workers away from high-skill jobs in their home economies and places them in low-skill jobs in the receiver economies (the so-called “brain waste” effect; Brücker and Damelang, 29, 30-31), the per capita GDP of both countries may be negatively impacted because the migrants’ skills are being squandered. They are, in fact, taking jobs that may not improve the per capita GDP of their hosts and their abilities are now absent from their home economies. Language barriers and skills incompatibilities may also make worker migrants less productive than native employees, which would not improve receiver-country per capita GDP. In contrast, one could contend that pulling unemployed or underemployed workers out of sender countries might actually improve those economies’ per capita GDP calculations because those workers may no longer be part of the denominators of those equations. A further alternative argument based on classical economic theory would state that the per capita GDP totals of both countries should be improved by migration because the workers’ skills are better distributed across both economies after migration is complete, leading to an overall improvement in each state’s productivity. In short, these migration-GDP relationships are omitted from this analysis because the directions of their effects are theoretically unclear.

Two potential relationships that include employment as the affected variable could also be derived from the causal loop diagram. The first of these associations involves the number of net worker migrants<sup>54</sup> and host-country employment in that one could speculate that there should be a negative relationship between these two variables as migrants compete with native workers for jobs. Host-country employment would therefore decrease as more workers enter an employment market with only a limited number of jobs. However, as dual labor market theory asserts (Piore, 35-43; Massey et.

al., 28-34), many times migrants fill positions that are open because no receiver-country workers want to take them. This theory would therefore imply that migration has a limited or null impact on overall receiver-country employment because receiver and sender-country workers are compliments to one another rather than competitors with each other. Once again, this relationship is excluded from this systems model because its theoretical direction is not well-enough established in the literature. The other variable that could impact employment is education level; the idea in this relationship is that increased levels of education grant workers more skills and thus make them more employable. While it is certainly true that raising the level of education in a country increases per capita GDP because enhanced education makes workers more productive, it is unclear that augmenting the level of education in a country should have a similar effect on unemployment. Other factors may intervene here; more specifically, if there are no jobs for educated workers once they leave school or if their academic training is not what employers require, it may be that the country simply has more highly educated unemployed individuals. In short, the education-employment relationship is left out of this study because it is uncertain that the former really influences the latter in a theoretically predictable fashion.

*Baseline Model Operationalization*--Most of the data sources, operationalizations and assumptions (e.g., all CEEC10 member states enter the EU in 2004, the approximately two-percent economic convergence rate) for the baseline systems model are the same as for the statistical model in the previous chapter; any questions or concerns related to these issues should refer back to that material. However, this section highlights where these matters differ between the two types of models, starting with the topic of population

change. The baseline experiment for the statistical model does not include any population changes, whereas the baseline systems model does since systems modeling makes incorporating projected population changes a relatively simple matter. For the sake of consistency, the statistical model results for the variant that employs World Bank (2009) population projection data<sup>55</sup> is adopted for baseline systems model comparison purposes. Another particular difference between the two models involves each model's treatment of sender and receiver-country employment. Both baseline runs utilize the average employment rate between 1996 and 2003 as the initial values for sender and host-country employment. While those totals are held constant throughout all of the statistical model variants, even the ones that use high and low economic incentives, those amounts shift in the systems models due to the impact of GDP (and, in the case of sender-country employment, per capita migrant stock as well) changes on them. As one might suspect, these alterations have interesting effects on the calculations of the migration rates<sup>56</sup> and projected numbers of migrants moving from the ten CEE countries to the EU15 member states. A final distinctive feature of the systems models that makes them somewhat different from the statistical models arises in how the free migration policy variable is treated. In the statistical model-based projections, its coefficient can simply be added to the migration rate equation in the appropriate year. However, this relationship must be operationalized in the systems models using Boolean algebra so that free migration policy presence impacts the migration rate starting at the correct time (2011 in the baseline model).

To summarize the model construction process, Figure 4.2 illustrates the fundamental building-block stock and flow unit<sup>57</sup> of the systems model. This same

Bulgarian Basics

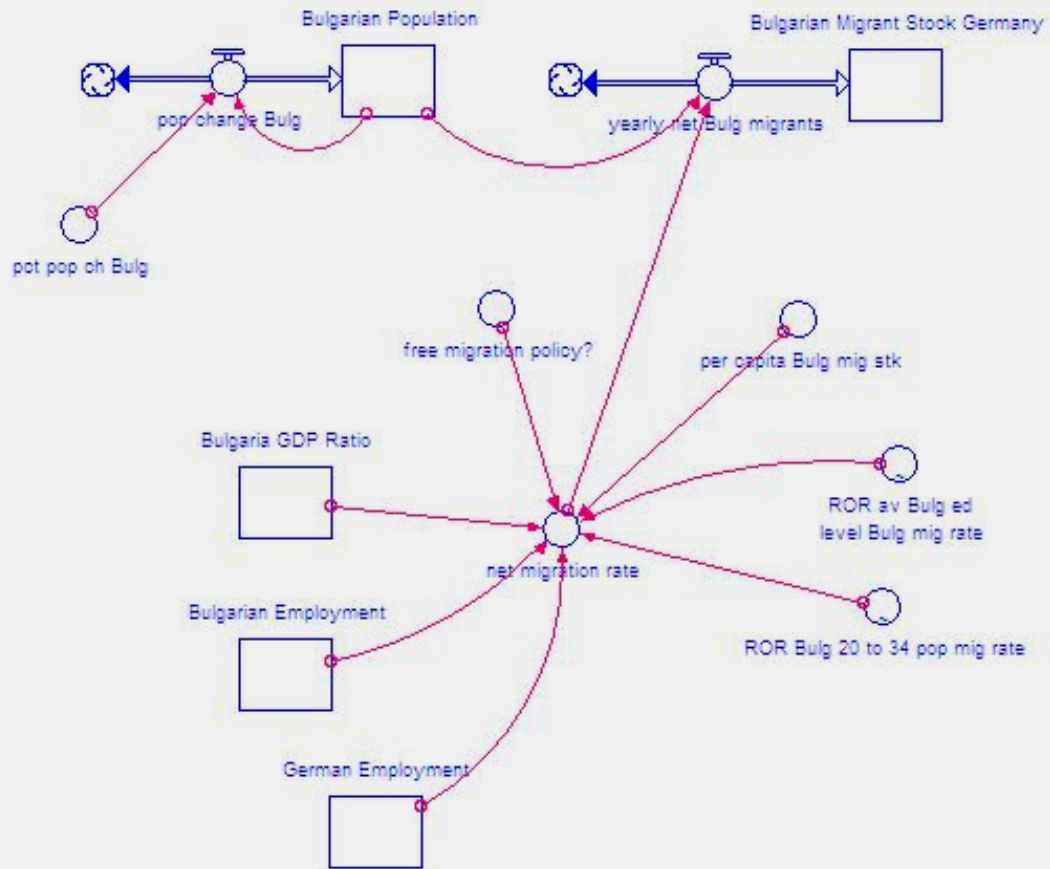
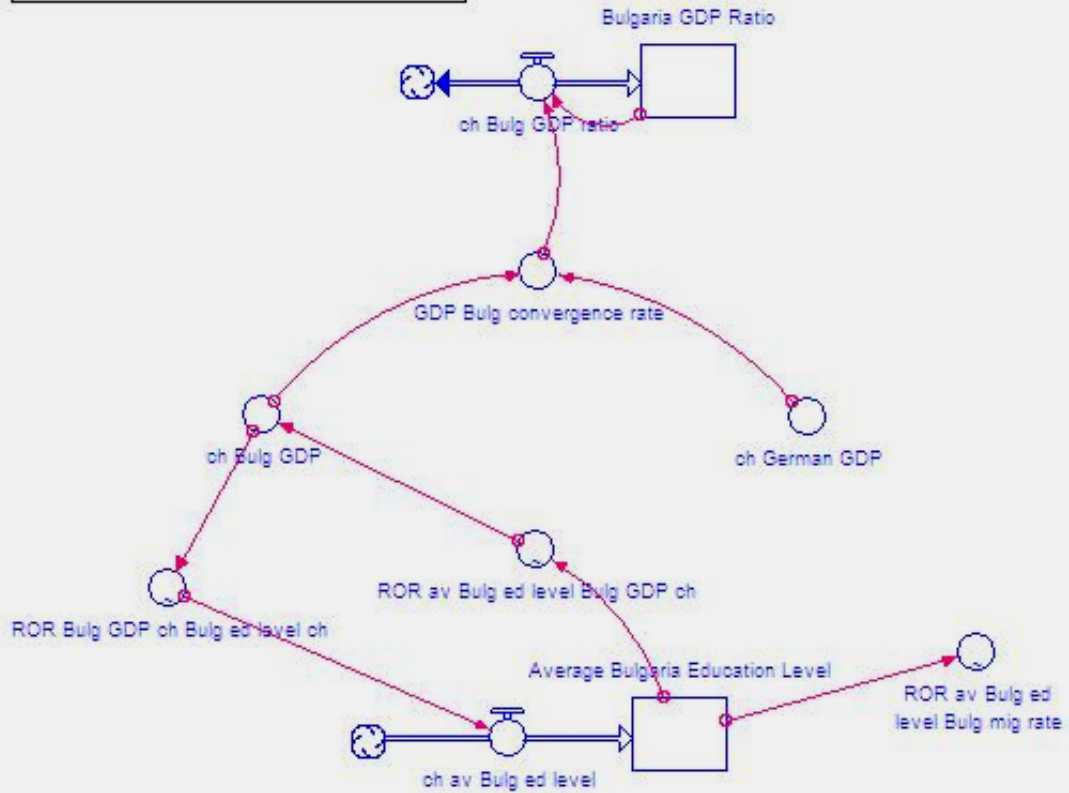


Figure 4.2: Stock and Flow Diagram of Systems Model Unit Block

Bulgarian Variable Creation Page I



College Migrants Sub-Model (Note: does not affect migration rate)

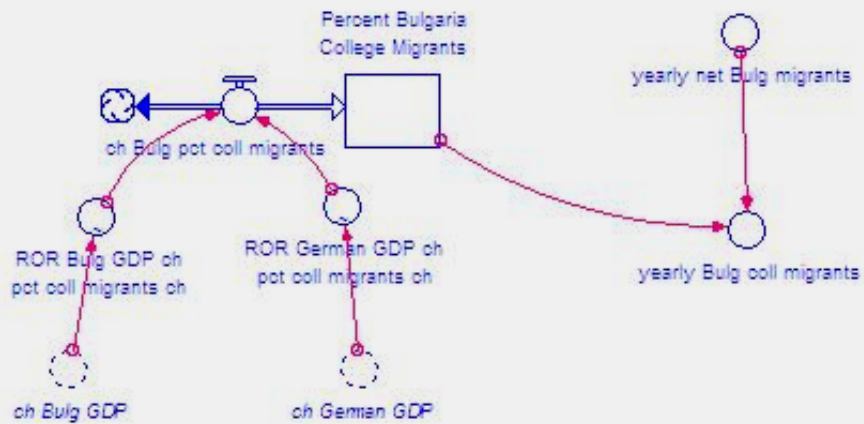


Figure 4.2 (continued): Stock and Flow Diagram of Systems Model Unit Block

Bulgarian Variable Creation Page II

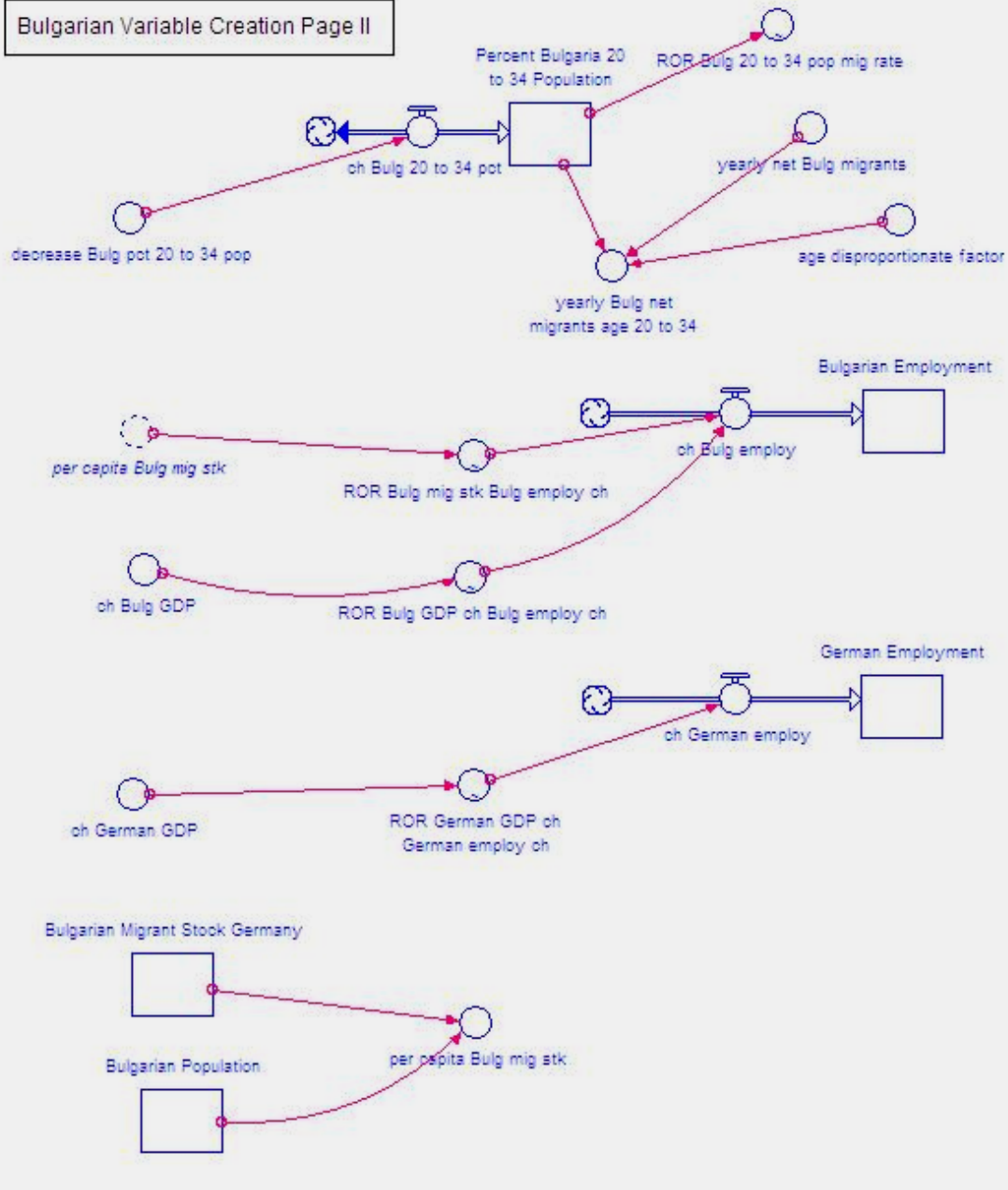


Figure 4.2 (continued): Stock and Flow Diagram of Systems Model Unit Block

architecture exists for all ten donor countries, and it should be noted that the accumulation stocks (e.g., the ones for total sender-country net migrants) and converters (e.g., “CEEC10 total net migrants to Germany”) are excluded<sup>58</sup> from this picture. A very different representation of the same information can be located in this chapter’s appendix, which contains the equations<sup>59</sup> that define the baseline systems model. Although the stock and flow diagrams and equation systems in this appendix appear quite dissimilar on the surface, it can be safely asserted that they convey the same model structure information. Finally, the initial values for the most important country-specific stocks and converters are situated in Table 4.1. Many of these figures are the same as those that are used for the baseline statistical model, but there are some that are new to the systems model.

*Previous-Data Model Test*--Before explicating the projection results of the systems model, it would be reasonable to discuss an examination of the model’s predictive accuracy using data from 1996<sup>60</sup> to 2003. Just as with the similar work involving the baseline statistical<sup>61</sup> model, the question here is how much one can trust the forecasting capacity of the systems model given its ability to “predict” known data points. In conducting this investigation, 1996 data<sup>62</sup> from the statistical modeling material and from the sources described previously in this chapter are utilized, with a few exceptions. The exclusions from that blanket statement primarily revolve around how sender-country GDP change, population change, and young worker proportion (level and change) are programmed. In both baseline forecasting models, donor-country GDP change is estimated so as to create a two-percent convergence between it and the receiver-country’s GDP. However, in this examination of the baseline system model’s predictive capability,

Table 4.1: Starting Values for Selected Baseline Systems Model Stocks and Converters

Country	Population	Pct Population Change	Migrant Stock	GDP Ratio	GDP Change
Bulgaria	7,824,000	-0.00850	44300	3.0494	1.033539
Czech Republic	10,202,000	-0.00133	30186	1.9328	1.034598
Estonia	1,354,000	-0.00283	4220	1.3350	1.034350
Hungary	10,130,000	-0.00333	54714	2.4090	1.033736
Latvia	2,325,000	-0.00517	9341	1.9691	1.034899
Lithuania	3,454,000	-0.00500	13985	2.3972	1.035017
Poland	38,195,000	-0.00400	326882	2.4947	1.034163
Romania	21,734,000	-0.00617	89104	5.4541	1.032656
Slovakia	5,379,000	-0.00200	19567	2.0383	1.034430
Slovenia	1,997,000	-0.00250	21795	1.3679	1.034308

Country	Average Education Level	Pct College Migrants	Pct 20-34	Decrease 20-34	Employment
Bulgaria	11.157	0.313	0.2178	-0.002800	84.9375
Czech Republic	12.216	0.356	0.2363	-0.003252	93.0125
Estonia	11.968	0.169	0.2155	-0.002056	89
Hungary	11.354	0.266	0.2285	-0.002568	92.875
Latvia	12.517	0.113	0.2155	-0.002820	85.625
Lithuania	12.635	0.159	0.2111	-0.002336	85.2125
Poland	11.781	0.217	0.2389	-0.003460	84.7875
Romania	10.205	0.141	0.2371	-0.003116	93.1375
Slovakia	12.048	0.158	0.2493	-0.003612	84.3125
Slovenia	11.926	0.092	0.2194	-0.002672	93.1125

Change German GDP: 1.0141

German Employment: 91.2125

Note: the numbers for “Pct Population Change”, “Pct College Migrants” and “Pct 20-34” are actually proportions or rates rather than percentages; these labels are used here because that is how they are marked in the stock and flow diagrams.

the average rate of the new member-state annual GDP changes between 1996 and 2003 is utilized instead. This calculation is the same as the one that grants the 1.41 percent average yearly GDP change employed for German GDP in the forecast models. Population changes are calculated in a similar fashion in that the average rate of annual population change between 1996 and 2003 is used here to estimate sender-country population levels and shifts. Matters are somewhat more complex in calculating the young worker proportion variables because United Nations Demographic Yearbook data must be employed rather than World Bank data and there are years missing in the time series for all of the donor countries. This latter observation implies that one cannot use the average rate of annual change in the sender-countries' twenty to thirty-four year old population to program the young worker proportion change converter; rather, the overall average annual change from 1996 to 2003<sup>63</sup> must be employed instead. Although that makes this change variable different from the others utilized in this test model, it is impossible to avoid that divergence in methods given the circumstances.

The results of the present investigation into the adequacy of the systems model are actually fairly encouraging. Just like with the statistical model, the projected totals for worker migration in 2003 are compared with the actual CEEC10 population movements to Germany in that year. In this instance, the difference between the actual (33,085) and projected (32,765) worker migration is less than one (-0.977) percent. As is true for the statistical model, the estimates for individual countries<sup>64</sup> in 2003 might be off the mark, but the differences between the overall totals are quite small. The systems model permits this research to make an additional check on the accuracy of this forecast; namely, it can compare the projection results based on the 1996 data with the actual CEEC10 worker

movements for the entire 1997 to 2003 period. The outcomes of this test are also quite good (a predicted total of 231,584 worker migrants compared to the actual total of 226,950, for a difference of almost exactly two percent), even though again the differences for individual countries can be fairly large. Overall, given the assumptions of this model, the data problems described earlier, and the economic upheaval that occurred in the CEEC10 during these years, both of these tests should grant one a sense that this model can be an accurate predictor of CEEC10 worker migration in the future.

### **Model Results and Testing:**

In general, the results of the systems modeling projections using the baseline model and its alternative specifications forecast a modest future movement of workers from the CEEC10 to the EU15 member states. Tables 4.2 and 4.3 provide the final values for many of the variables<sup>65</sup> in the baseline model and the worker migrant totals for all ten newly-accessioned states, respectively. As one can determine from the latter table, the baseline systems model forecasts that a slightly smaller percentage of CEEC10 migrants will have moved to the EU15 countries by 2030 than the population-adjusted statistical model does (1.310 percent versus 1.331 percent). Although much more information is presented in the discussion section of this chapter explicating the magnitude of the systems model worker migrant totals, it is noteworthy here that the varying influences on the migration rate interact to produce a reduction in the number of workers shifting from one economy to another rather than an enhancement. Additionally, the dynamic pattern of the systems model flows is slightly different from that of the statistical model; for instance, the migration rate decreases constantly over time for all ten systems model countries (except for the jump when the free migration policy is introduced in 2011), but

Table 4.2: Final (2030) Values for Selected Baseline Systems Model Variables

Country	Population	Migrant Stock	GDP Ratio	GDP Change
Bulgaria	6,213,442	117082	1.8061	1.033630
Czech Republic	9,841,911	89418	1.1122	1.034692
Estonia	1,254,259	12171	0.7735	1.034443
Hungary	9,257,567	123255	1.4192	1.033827
Latvia	2,021,355	27775	1.1239	1.034993
Lithuania	3,016,793	43757	1.3639	1.035112
Poland	34,277,462	700118	1.4527	1.034255
Romania	18,389,352	274046	3.3151	1.032675
Slovakia	5,095,962	66570	1.1784	1.034523
Slovenia	1,866,494	33878	0.7934	1.034401

Country	Average Education Level	Pct College Migrants	Pct 20-34	Employment
Bulgaria	11.248	0.287	0.1422	86.1602
Czech Republic	12.310	0.328	0.1485	94.1081
Estonia	12.061	0.142	0.1600	90.0981
Hungary	11.445	0.239	0.1592	94.0345
Latvia	12.611	0.085	0.1394	86.8003
Lithuania	12.730	0.131	0.1480	86.4009
Poland	11.873	0.190	0.1455	86.0928
Romania	10.293	0.116	0.1530	94.2647
Slovakia	12.141	0.130	0.1518	85.4631
Slovenia	12.019	0.065	0.1473	94.4284

German Employment: 91.5932

Table 4.3: Baseline Forecast of Migration to Germany by CEE Country

Country	Baseline Systems Model 2004-2030 Migrants	Population-Adjusted Statistical Model 2004-2030 Migrants
Bulgaria	72,782	73,810
Czech Republic	59,232	60,785
Estonia	7,951	8,060
Hungary	68,541	69,128
Latvia	18,434	18,688
Lithuania	29,772	30,048
Poland	373,236	381,231
Romania	184,942	186,173
Slovakia	47,003	48,026
Slovenia	12,083	12,436
Total	873,975	888,384

Systems Model:

Total CEEC10 Migrants to All EU15 Member States: 1,343,750

Percentage of CEEC10 Population Migration to EU15 Countries: 1.310%

Statistical Model:

Total CEEC10 Migrants to All EU15 Member States: 1,365,904

Percentage of CEEC10 Population Migration to EU15 Countries: 1.331%

Table 4.4: Baseline Forecast of Migration to Germany by CEE Country and Selected Year

Country	2004	2010	2011	2015	2020	2025	2030	Total
Bulgaria	2911	2768	2843	2754	2651	2554	2465	72,782
Czech Republic	2300	2205	2322	2260	2182	2103	2022	59,232
Estonia	311	297	312	303	292	281	271	7,951
Hungary	2652	2552	2666	2602	2523	2446	2370	68,541
Latvia	725	694	718	699	675	653	631	18,434
Lithuania	1161	1117	1154	1126	1093	1061	1030	29,772
Poland	14269	13878	14304	14057	13759	13471	13193	373,236
Romania	7240	6949	7177	6995	6778	6573	6379	184,942
Slovakia	1779	1737	1800	1772	1738	1704	1670	47,003
Slovenia	469	450	473	460	445	429	414	12,083

it increases slightly over the run in a few of the statistical model cases (compare Table 4.4 to Table 3.11). Potential reasons for this observation are explored in the discussion section of this chapter as well. In order to ensure that no one variable in the systems model has too great of an impact on the baseline model and to investigate how the implementation of an important policy might affect the overall migration figures, several alternative migration scenarios are presented in Table 4.5. The conditions for each of these experiments are defined in the same way as in the alternative statistical models presented in Chapter Three (Table 3.12). These models behave similarly to the original formulation of the systems model and grant results that resemble those observed from the alternative statistical models as compared to their baseline operationalization. For instance, the continual presence or absence of the free migration variable has relatively limited bearing on the overall migration numbers, and the high and low migration-incentive conditions induce quite a few more or fewer workers to leave their home economies, respectively. Additionally, changing the assumptions in the economic conditions based alternatives affects some countries much more than others (e.g., compare how Bulgarian and Slovene workers react to these modified assumptions in both the systems and statistical models compared to their baseline forecasts). In short, the consistency of these alternatives' results with those observed from the statistical model's various operationalizations makes one more confident about the quality of the systems model's outcomes.

However, there remains one difference between the statistical and systems models that has not yet been explored thoroughly: population changes. Given the minor alterations described previously in how population changes are calculated and

Table 4.5: Alternative Systems Model Projections of 2004-2030 CEEC10 Migration

Country	Low-Incentive	High-Incentive	Free Movement 2004	No Free Movement
Bulgaria	49,344	79,435	73,587	70,879
Czech Republic	51,190	94,375	60,305	56,445
Estonia	5,293	10,910	8,092	7,590
Hungary	60,394	102,123	69,600	65,863
Latvia	11,654	21,001	18,676	17,837
Lithuania	19,238	33,156	30,131	28,883
Poland	250,212	406,108	377,221	363,247
Romania	169,781	255,981	187,195	179,454
Slovakia	28,384	50,947	47,568	45,550
Slovenia	10,595	18,911	12,293	11,548
Total (Germany)	656,086	1,072,948	884,667	847,297
Total (EU15)	1,008,742	1,649,674	1,360,190	1,302,732
%CEEC10 Migration	0.983	1.608	1.326	1.270

programmed between the systems and statistical models, it is imperative to ensure that any observed results disparities between them are not an artifact of this methodological shift. An examination of Table 4.6 in comparison to Table 4.3 (or Table 4.7 with Table 4.4) would confirm that although the divergent definitions of population change may have some effect on the final results, most of the observed decrease in migration between the systems and statistical models are a result of the former's new variables and relationships, not its calculation of population changes. A greater substantiation of this claim can be obtained by perusing the outcomes of the no population growth systems models displayed in Table 4.8 and comparing them to the corresponding statistical model runs in Table 3.12. The fact that these various no population growth models behave exactly as one might expect them to given the results of the previous modeling experiments also bolsters the case that these systems models' operationalizations are acceptable. In short, one should be able to conclude here that the observed systems model migrant population decrease is a real effect and not a data anomaly.

*Stress and Surprise Behavior Testing*--In order to assess the validity of a systems model's results, many extreme value (stress) and surprise behavior tests should be performed on it (Sterman 2000, 882-883). These diagnostics are important because they can reveal flaws in the model and illustrate some limitations that exist on its applicability. Some basic results from these tests can be spotted<sup>66</sup> in Table 4.9, along with an explanation of what some of the experiments do when it is not obvious from the description in the table. For the most part, this systems model survives the stress and surprise behavior testing quite well and the model behaves as initially expected; the exceptions to these statements are discussed in this section along with any interesting results that appear during these

Table 4.6: No Population Growth Systems Model Migration Projection

Country	No Population Growth Systems Model 2004-2030 Migrants	Baseline Statistical Model 2004-2030 Migrants
Bulgaria	79,823	80,755
Czech Republic	60,097	60,770
Estonia	8,200	8,317
Hungary	70,955	71,598
Latvia	19,516	19,826
Lithuania	31,478	31,933
Poland	388,995	392,887
Romania	198,109	199,000
Slovakia	48,077	48,399
Slovenia	12,332	12,573
Total	917,582	926,059

Systems Model:

Total CEEC10 Migrants to All EU15 Member States: 1,410,796

Percentage of CEEC10 Population Migration to EU15 Countries: 1.375%

Statistical Model:

Total CEEC10 Migrants to All EU15 Member States: 1,423,831

Percentage of CEEC10 Population Migration to EU15 Countries: 1.388%

Table 4.7: No Population Growth Systems Model Migration Projection by CEE Country and Year

Country	2004	2010	2011	2015	2020	2025	2030	Total
Bulgaria	2911	2896	2997	2989	2977	2964	2950	79,823
Czech Republic	2300	2221	2342	2290	2222	2152	2080	60,097
Estonia	311	302	318	312	304	296	287	8,200
Hungary	2652	2596	2720	2683	2636	2586	2534	70,955
Latvia	725	714	742	735	725	715	705	19,516
Lithuania	1161	1147	1191	1183	1172	1160	1148	31,478
Poland	14269	14160	14645	14578	14488	14392	14288	388,995
Romania	7240	7186	7463	7431	7388	7341	7291	198,109
Slovakia	1779	1756	1823	1808	1788	1767	1745	48,077
Slovenia	469	455	479	469	457	444	430	12,332

Table 4.8: No Population Growth Alternative Systems Model Projections of 2004-2030 CEEC10 Migration

Country	Low-Incentive	High-Incentive	Free Movement 2004	No Free Movement
Bulgaria	53,643	87,351	80,649	77,640
Czech Republic	51,892	95,862	61,174	57,249
Estonia	5,438	11,274	8,343	7,822
Hungary	62,392	106,038	72,025	68,128
Latvia	12,259	22,278	19,761	18,867
Lithuania	20,231	35,116	31,843	30,514
Poland	259,343	423,865	393,027	378,335
Romania	181,464	275,101	200,403	192,042
Slovakia	28,962	52,142	48,645	46,576
Slovenia	10,787	19,387	12,543	11,775
Total (Germany)	686,411	1,128,414	928,413	888,947
Total (EU15)	1,055,368	1,734,954	1,427,449	1,366,769
%CEEC10 Migration	1.029	1.691	1.391	1.332

Table 4.9: Selected Results from Stress and Surprise Behavior Tests

Test	Total CEEC10 Migrants (Germany)	Total CEEC10 Migrants (EU15)	% CEEC10 Migration (EU15)
50 year run	1,531,895	2,355,312	2.296
100 year run	2,739,501	4,212,025	4.106
-5% convergence	1,144,018	1,758,946	1.714
15% convergence	323,437	497,290	0.485
college education	867,929	1,334,455	1.301
primary education	879,913	1,352,880	1.319
no education	886,273	1,362,658	1.328
GDP Ratio = 10	1,237,872	1,903,248	1.855
GDP Ratio = 20	1,434,987	2,206,315	2.151
GDP Ratio = 0.5	385,955	593,412	0.578
donor employment = 50	2,416,722	3,715,748	3.622
German employment = 50	0	0	0
1/10 population	181,236	278,653	2.716
10x population	7,801,536	11,994,982	1.169
2x 20-34 population	940,296	1,445,720	1.409
0.5x 20-34 population	840,815	1,292,766	1.260
war! = 10	869,782	1,337,303	1.303
war! = 50	851,448	1,309,114	1.276
disaster! = 10	858,345	13,197,181	1.286
disaster! = 100	702,041	1,079,399	1.052
depression! = 0.1	889,789	1,368,064	1.333

Note: the titles for each test refer to the values that these variables have for all ten countries, where appropriate. For instance, “college education” means that all ten CEE states have an initial average education level equal to seventeen, and “10x population” implies that each CEE country starts the run with a population ten times what is actually observed in 2003. The “disaster!”, “depression!”, and “war!” entries refer to new surprise behavior variables that are utilized solely for these tests. “Disaster!” creates a one-year (2015) ten or hundred-fold increase in the population change variables to simulate a major natural calamity; “depression!” produces a ten percent (0.1) decrease in the sender countries’ GDP level for one year (2015); and “war!” generates a ten or fifty-fold boost to the young worker population decrease converter for one year (2015). Each of these surprise behavior variables are programmed into the systems modeling software using Boolean algebra in a fashion similar to that of the free migration variable. In every case, no values other than the ones listed in the label are changed; in all cases but the first two, each experiment runs from 2004 to 2030. It should also be noted here that the CEEC10 population values are multiplied by the appropriate factors to calculate the percentage of CEEC10 migration in the one-tenth and tenfold population experiments.

experiments. The first exemption from the assertion that the model performs as expected can be found in the long-term (fifty and one hundred-year) diagnostic tests. While the model seems to be perfectly fine in the test that lasts until 2053, two of the reservoirs (young workers and college migrants) for each sender country empty completely<sup>67</sup> or come very close to voiding by 2103. Although the model is only designed to illustrate the moderately long-term possibilities for CEEC10-EU15 migration, the presence of these vacant reservoirs is an indication of a missing balancing loop or other structural element in the model that would need to be added if it were to be used for long-term forecasts. This point is explored in more detail in the discussion portion of this chapter along with some of the other noteworthy results of these model-testing experiments.

The GDP convergence tests evince some interesting findings, starting with the fact that the negative five-percent convergence (five-percent divergence) experiment grants several outcomes that are reversed from what the baseline model displays. For instance, this stress test model has decreasing employment and education level figures along with increasing percentages of worker migrants possessing a college education. These products are a mirror image of what the baseline model has and are what would be predicted given the relationships constructed in the initial systems model. In addition, a considerably larger number of worker migrants arrive in the EU15 countries under the conditions of this test, a consequence of this alteration to the model's conditions that would have been expected. The extreme convergence model also behaves as one would have presumed, with a great reduction in the total number of worker migrants who would take jobs in the EU15 countries. In fact, after a time the yearly flows of workers (although not the migrant stocks) turn negative, implying that eventually more workers

would be induced to return to their home countries than would leave from there to Germany. This observation<sup>68</sup> demonstrates that the model's net flows can be negative as well as positive, a fact that would not necessarily be obvious from its previous runs.

While the GDP ratio stock experiments behave exactly as one would expect and without any serious issues, the investigations involving education are remarkable because none of them produce much change in the final number of migrants who move to the EU15 economies. That result occurs because there are counterbalancing effects of improved education levels on the migration rate. A higher level of education within a country's population leads directly to higher migration totals in this model because workers have more and better skills to exploit in their receiver-country economies. However, increases in education also generate enhancements in sender-country GDP changes, which raises the convergence rate between the host and donor economies and thus accelerates the rate at which the GDP ratio shrinks. An attenuated ratio between the receiver and sender countries' per capita gross domestic products then reduces the migration rate between them and lowers the overall number of workers who switch economies. In each of these three education-related experiments, the indirect GDP ratio impact is stronger than the direct effect, but these offsetting influences prevent any huge shifts in the final worker migrant figures. Another fascinating set of stress tests is comprised of the employment figures for Germany and the various CEE donor countries. Dropping the starting sender-country employment total to fifty percent creates an enormous increase in the number of CEEC10 migrants, as one might anticipate, but otherwise the model behaves well. However, reducing the host-country employment level to fifty percent induces no net CEEC10 workers to shift economies over the quarter-

century of this experiment. In fact, in all but two cases, the migrant stocks of the CEEC10 are exhausted by the end of that period, leaving no “donor-country” workers in Germany at all. A brief consideration of the intuition behind this result would reveal why it makes sense; at some level, it would be amazing that there would be any workers of any type<sup>69</sup> left in a country with roughly fifty percent unemployment. In short, the systems model behaves here exactly as one would presume it would under these conditions.

The two groups of extreme value trials involving various aspects of the population figures in the model also display some interesting outcomes, although they are not quite as remarkable as the ones from the tests that utilize education stock. For instance, the one-tenth and tenfold sender-country population experiments do not simply decrease the number of migrants by around ninety percent or increase it by ten times, respectively. That straightforward expectation is not fulfilled because of the impact this change has on the per capita migrant stock denominator and the further moderating impact that migrant stock has on the migration rate calculation. Even though these models behave as one might predict otherwise, this wrinkle in the results is worthy of note because it demonstrates how the complexities of systems models can frustrate anticipated outcomes. Alterations to the young worker population proportion<sup>70</sup> also produce some interesting outcomes in that even large-scale alterations to these figures do not affect the migration rate very much. They do generate changes in the expected directions (i.e., a doubling of the young worker population proportion increases the number of migrating workers), but these shifts are not very large.

The observation that the young worker population proportion stock does not impact the overall migration rate very much is continued in the discussion of the surprise

behavior converter that utilizes this variable, “war!”. The purpose of a surprise behavior test is to shock the system with a huge increase or decrease in a particular variable and see how well the system responds to that sudden spike in value. In this case, because war-fighting predominantly involves the part of the population<sup>71</sup> represented by the young worker variable, an intense elevation of the rate of decrease of this part of the population is introduced as if a conflict would occur in 2015. This year is chosen not because it is anticipated that a war will commence then; it is designated as the period of this conflict because that year should give the system sufficient time to recover from any disequilibria that this abrupt increase might cause. There is also enough time before 2015 here that the model’s pre-shock trends should be easily detectable by its observers. In fact, the system’s dynamics behave normally both before and after this blow to the system, even though there is a slight decline in the overall forecasted number of migrants who arrive in the EU15 countries according to this projection. That contention holds true even when there is a fifty-fold enhancement to the decrease in the young worker population proportion for one year.

Although the systems model behaves as one would anticipate under the influence of the sudden economic crisis variable “depression!”, the same cannot be asserted as whole-heartedly for the natural calamity variable “disaster!”. Since a catastrophe like a plague, hurricane, or earthquake generally affects all age groups<sup>72</sup> in a society’s population equally, “disaster!” is the label for the surprise behavior test variable for population change (decrease). The fascinating part of these experiments is that even though the final percentage of the population that migrates is lower in both the tenfold and hundredfold increase cases because there are fewer people left to migrate after the

disaster, that reduction is considerably smaller than one might initially expect. This outcome is due to the impact that the sudden decrease in the population has on the per capita migrant stock variable. A large reduction in the denominator of per capita migrant stock produces a corresponding increase in its overall value, which then generates an increase in the migration rate that partially offsets the decrease in migrants created by the rapid population loss. The latter effect certainly overwhelms the former in the end, and the model returns to equilibrium quickly after the “disaster”, but this surprising result is precisely why one utilizes systems modeling in the first place.

*Assumption Testing:* The final phase of the model testing process involves examining many of the assumptions about the magnitudes of most of the new relationships that are posited in this analysis. These assumptions are located in the graphical functions<sup>73</sup> that program most of these relationships in the systems modeling software. The overriding purposes of these experiments are to determine whether the final results of the baseline model are overly dependent on any particular assumption and to ascertain if any of the relationships or variables in the model are problematic. All of these runs are operationalized by multiplying the appropriate relationship factor by ten; for instance, a one-percent increase in sender or recipient-country GDP now generates, *ceteris paribus*, a 0.1 percent enhancement to donor or host-country employment. The first association that is examined in this fashion is the one between GDP change and education level change (ROR <donor country> GDP ch <donor country> ed level ch). A preliminary inspection of this relationship might lead one to presume that a tenfold increase in the effect of GDP changes on the sender-countries’ average education levels would induce a considerable boost to migration flows because improved education levels produce higher

migration rates here. However, that tenfold enhancement in the impact of GDP changes also heightens the effect of the other new relationship in which average education level is involved, the one between that stock and donor-country GDP changes. This connection creates a negative impact on the overall migration rate because increases in education level lead to improvements in GDP, which then raises the convergence rate and accelerates the speed with which the GDP ratio between the sender and receiver country shrinks. This more rapidly dwindling ratio induces fewer donor-country migrants to leave home because the economic advantages to moving are not as great as they might otherwise have been. That argument implies that it would be difficult to know *a priori* which one of these influences would be dominant in this scenario. In fact, the former influence is minutely more powerful than the latter one as less than 0.001 percent more migrants arrive in this experiment (Table 4.10) compared to the baseline model. In short, the magnitude of this new relationship does not have an oversized impact on the final results of the systems model, and it otherwise behaves as expected.

The next two connections that are explored here are the others that are associated with the average sender-country education level stock. As is true for the previous relationship, the effect of enhancing the magnitude of the graphical function for the link between education level and GDP change is difficult to predict ahead of time, but for a different reason than before. In this case, the overall impact of this experiment depends on the average sender-country education levels themselves because they generate below-zero figures for fewer than twelve years of education and above-zero figures when the average education level is greater than twelve years. In other words, countries that have an average education level of less than secondary school completion experience negative

Table 4.10: Selected Results from Assumptions Tests

Test	Total CEEC10 Migrants (Germany)	Total CEEC10 Migrants (EU15)	% CEEC10 Migration (EU15)
GDP change- education level change	874,075	1,343,904	1.310
education level- GDP change	891,277	1,370,352	1.336
education level- migration rate	861,695	1,324,869	1.291
young worker proportion- migration rate	861,350	1,324,339	1.291
migrant stock- donor employ change	843,363	1,296,683	1.264
donor GDP change- donor employ change	761,085	1,170,180	1.141
German GDP change- German employ change	922,101	1,417,745	1.382

Baseline Systems Model Percentage CEEC10 Migration (EU15): 1.310%

effects in their GDP changes and the converse is true for states whose citizens have an average level of education of above high-school completion. These GDP modifications then produce the alterations in GDP convergence, GDP ratio level, and migration rate described previously. In the end, a slight increase in CEEC10 migrants to the EU15 countries is detected (1.336 percent of the CEEC10 population compared to 1.310 percent in the baseline case) due to the negative effects on GDP changes outweighing the positive ones. One could therefore argue that this assumption has only a very limited effect on the results of this systems model. The donor-country education level-migration rate relationship has the same prediction problem as the education level-GDP change one in that it is not obvious from the start whether the influences of the below-secondary school education average states can outweigh those from countries with an above-secondary school average or not. If the education level-GDP change results are an accurate guide to what should happen here, one would predict that an overall reduction in CEEC10 migrants should be detected in this test. That outcome should occur because the education level-migration rate graphical function has a direct effect on the migration rate, and if the negative average level of education effects overwhelm the positive ones in the previous test they should in this trial as well. In fact, a tiny decrease in the total percentage of CEEC10 net migrants compared to the baseline model (1.291 versus 1.310 percent) is found in this experiment. This small net migration decline, just like the slight changes produced in the previous education-related assumption tests, leads one to conclude that this assumption also does not have an outsized impact on the overall results of the systems model.

The other graphical function involving migration rate directly is the one connecting this quantity and donor-country young worker population proportion. Just like with the first function directly tied to migration rate, it is not obvious what the initial expectations of the effect of this assumption test on that rate should be. That assertion can be leveled because although each sender-country's young worker proportion starts at above twenty percent (thus creating a positive effect on the migration rate), the decreasing young worker proportion converter drags all of these economies' proportions below twenty percent (thereby producing a negative effect on migration rate) by 2030. However, at this juncture one might be able to forecast that the combination of these impacts should balance each other out, leading to a mild overall effect on the final results for this assumption. That initial belief is justified, as the observed migration decrease in this experiment is only fractionally smaller than the one observed for the education level-migration rate test. Due to its operationalization, the trial results for the one graphical function that utilizes per capita migrant stock rather than migration rate as a variable should be relatively easy to forecast. Since the relationship between migrant stock and sender-country employment always produces a result greater than zero, boosting this effect tenfold should always increase donor-country employment and thus decrease that economy's migration rate. That prediction is an accurate one, as there is a small decrease in CEEC10 migration observed in this experiment compared to the baseline model (1.264 versus 1.310 percent), and the model components behave reasonably well otherwise. In short, neither of the assumptions described in this paragraph have an undue impact on the final results of the systems model.

However, matters are somewhat different when one turns to the final two assumptions<sup>74</sup> explicated in this section. These graphical functions describe the connection between sender-country per capita GDP change and employment change and receiver-country per capita GDP change and employment change, respectively. At the outset of these experiments, one would presume that a tenfold jump in the effect of sender-country GDP change on its employment level would lead to an increase in donor-country employment and thus a reduction in its migration rate due to the associations between these variables and the graphical function's operationalization. The converse position could be staked out concerning the impact that a tenfold boost in the effect that receiver-country GDP change would have on its employment level and migration rate. In fact, the directions of these predicted changes are observed exactly as the previous sentences indicate they would be; however, the magnitude of these shifts and the behavior of some of the other variables in the systems model under these conditions are problematic. First, the size of these two changes is considerably larger than those produced by the previous five assumption tests, even if in the broader picture these alterations are still moderate in scope. This observation indicates that this model is more sensitive to the size of the GDP change-employment change assumptions than the others in the model and that one should be mildly cautious in interpreting the results of the systems model due to the relative importance of this assumption. However, the larger issue is that in the donor GDP change-donor employment change trial, the tenfold enhancement of the effect of the former variable on the latter leads to at least four countries exceeding one-hundred percent employment by the end of the run. That outcome is logically impossible, and exposes both a limitation of this model and a

potentially problematic dependence of the results upon this assumption. While it is true that this issue is suggested by the results of some of the stress tests and other assumption experiments, the donor GDP change-donor employment change experiment is the only place where it appears in full force. This problem could theoretically be shared by some of the other stocks in this model as well, a difficulty that is also hinted at in some of the other systems-model testing. Although the appropriate part of the final section of this chapter explicates the implications of this issue in some detail, it should be kept in mind here that the discovery of this problem does not void the results of this model. The successful older data tests described previously are, in fact, a better measure of the accuracy and validity of the systems model. However, this assumption experiment does pinpoint a limitation of this model that should be addressed in a future iteration of this analysis, a matter that is returned to later.

### **Discussion and Conclusion:**

At this stage of the chapter, it is appropriate to review what the outcomes of this research determine and weigh its utility in an appropriate fashion. Overall, the baseline systems model and its alternative specifications forecast that a slightly smaller percentage of CEEC10 worker migrants could be expected to arrive in the EU15 economies by 2030 than the statistical model predicts. Since the latter method envisages a smaller percentage of these workers leaving the CEEC10 economies than most of the literature on this question predicts, the systems model's results provide perhaps an improved background for the policy discussion that takes place in the concluding chapter of this effort. In the meantime, the critical question of why the systems model generates lower CEEC10 migrant figures than the statistical model does, even taking into account the

methodological differences described in two<sup>75</sup> earlier endnotes, remains. The key to addressing this question lies in both the conservative nature of the assumptions that are made in this analysis and the new relationships that are posited in this model. It is the second of these assertions that is the focus of the majority of the discussion that follows on this question.

The two new variables that are included in the systems model, young worker proportion and average sender-country education level, have direct impacts on the migration rate value, so it is with those entities that this discussion begins. As indicated elsewhere, the young worker cohort stock should have a positive relationship with the migration rate converter, but the magnitude and sign of the effect of the former on the latter depends on the stock's value. It is therefore difficult to know ahead of time whether the young worker proportion variable would have an overall positive or negative impact on the migration rate. However, it is known from the assumption testing experiments that this variable reduces the migration rate over the course of the period in question and thus the number of CEEC10 migrants who shift economies. A similar argument could be composed concerning the other new variable that directly impacts migration rate, average education level. Again, this concept should have a positive relationship with the migration rate, but the overall sign and magnitude of education level's effect on this converter is difficult to determine *a priori*. The assumption experimentation does provide a *post-hoc* answer to that question, however, as a similarly negative effect on migration rate as the young worker stock creates is observed here. It should also be noted in this explication that the GDP change-educational level change graphical function also impacts migration rate indirectly through the latter. Although it is known from the assumptions

testing that this result should be positive, it is so small that it is apparently overwhelmed by the much larger direct negative effect of the education level stock on migration rate. These two education level related functions also stimulate the migration rate figure indirectly through their impacts on donor-country GDP change and thus donor-country GDP ratio as well. Since the education levels for the CEEC10 are generally below secondary school final career achievement and stay that way for the most part throughout the baseline experiment, one can safely conclude that the education level function induces an overall negative effect on sender-country GDP change. That reduction occurs despite the positive impact that donor-country GDP change<sup>76</sup> has on education level change. This negative effect on GDP change decelerates the convergence of the sender-country economies with that of the receiver country and thus increases the migration rate over that calculated by the statistical model. In short, these new variables create two overall negative and one overall positive influence on the donor-countries' migration rate values.

The receiver and sender-country GDP change variables also have important impacts on the migration rate in the directions visualized by the causal loop diagram<sup>77</sup> polarities. The baseline model assumes that average annual per capita GDP growth in Germany is about 1.4 percent over the course of the experiment and that same figure in the donor countries is around 3.4 percent. One should also expect that German GDP growth has an overall positive effect on migration rate and that sender-country GDP growth has a negative impact on that figure via the host and donor-country employment variables respectively. That latter negative effect is reduced somewhat by the negative influence that the average education level has on sender-country GDP change cited

above, but the overall influence of sender-country GDP on the migration rate remains negative as can be seen in Table 4.10. Given the projected GDP growth rates adopted by the baseline model and the coefficients of the employment variables in the migration rate calculation, one might also expect that changes to the sender-country employment values would create more dramatic alterations of the migration rate than those to receiver-country employment. This notion is also confirmed by the assumption experiments table. Elucidating the effect that per capita migrant stock has on the migration rate is a bit more complicated than for some of the other variables, however. An investigation of the annual migrant flow data for the baseline systems model and the comparable statistical model indicates that fewer workers move from the CEEC10 economies to Germany each year even from the start of the process. That fact implies that the per capita migrant stock increases more slowly in the systems model projection compared to the statistical model forecast. According to network theory (and visualized as reinforcing loop  $R_1$ ), this observation implies that the migration rate is also relatively depressed by this reduced number of worker migrants as in a vicious cycle. However, the reduction produced by this reinforcing loop is offset by the increase in migration rate created by the balancing loop ( $B_1$ ) formed by per capita migrant stock, donor-country employment, and number of net worker migrants; this contention is also confirmed by the relevant result in the assumption<sup>78</sup> testing table. In summary, it is the overall balance between these various new positive and negative influences on the migration rate's magnitude that generates the small net negative change in total migrants observed in the baseline systems model as compared to the population-adjusted statistical model.

*Model Limitations*--As indicated previously, the rigorous and thorough testing that the baseline systems model is subjected to in this analysis reveals no major flaws in it but does expose a few areas of concern that should be addressed in this section of the research. In particular, the young worker proportion and percent college migrants variables fall to zero in some of the stress and assumptions trials, while the sender-country employment variable<sup>79</sup> tops one-hundred percent in the donor GDP change-donor employment change assumption test and approaches that limit in several others. It should be kept in mind here that the basic purpose of these extreme conditions and assumptions tests is to push the systems model as far as it can go without breaking it. Once one does break it, one should step back and see just how much pressure the model is able to withstand before falling apart. On those scores, the systems model performs well; especially for a relatively simple model, it is flexible and stable under a variety of stressful conditions. More to the point, under reasonable assumptions and conditions, the results of the systems model are quite realistic. The outcomes of the one-year (2003) and seven-year (1997-2003) "forecast" tests described earlier should bolster the legitimacy of that claim.

Although parsimony can be a goal of model-building, it should not be an excuse for refusing to complicate a model when necessary (King et. al., 20) or for not improving a model when given the chance to do so. With that notion in mind, there are at least three different strategies that could be adopted to ameliorate the issues exposed by the model testing. The first possibility would be to alter the graphical functions that involve the college migrant and employment variables<sup>80</sup> so that higher levels of GDP growth and migrant stock presence would have progressively smaller impacts on employment and

college migrant percentage change. This action would essentially create limit function-like structures in the relevant graphical functions rather than the linear relationships that are utilized elsewhere in this analysis. The problem with this strategy is that there is not much evidence for this alternative underlying structure, whereas linear relationships are the most common and logical presumptions to make when trying to determine how two variables relate to one another. A second option might be to include new relationships in the current model in order to address these stock problems. In general, that would mean revisiting some of the rejected relationships, especially the ones involving sender and receiver-country employment, described earlier in this chapter. For instance, adding a negative relationship between net worker migrants and host country employment would create a balancing loop that should make it more difficult for host-country employment to exceed the one-hundred percent logical limit. However, there were very good justifications for eliminating those relationships from the systems model in the first place, and one should be loathe to reject these reasons without very good cause. Finally, one could insert new variables into the model to endogenize certain features of it that are now treated as exogenous or to construct balancing loops that could control the growth of particular variables. For example, the addition of a donor-country labor costs variable would produce a balancing loop with donor-country employment. That loop would be established because as employment increases, labor costs would also increase, which would in turn decrease employment as it becomes more expensive for companies to hire new workers. Although this loop could limit the growth of sender-country employment, one must be cautious about incorporating new variables into a systems model in an *ad hoc* fashion simply to correct its perceived weaknesses. Again, the unadulterated baseline

model performs fairly well under typical circumstances, and it would be questionable whether adding this loop to correct this extreme value-induced condition would be worth making the model more complicated. In short, future iterations of this systems model could address this model's limitations, but they should not do so in a theoretically haphazard fashion.

*Conclusion*--Although in the last few decades systems modeling has not been employed very often in political science, it has proven to be a useful tool in studying the CEEC10-EU15 migration system because it permits an expanded list of influences on migration to be included in the analysis. In this way, systems modeling acts as a complement to the statistical modeling presented in the previous chapter. Both models forecast that only a limited number of CEEC10 worker migrants are likely to transit to the EU15 countries over the next few decades. That statement holds true under many different alternative specifications, even those intended to maximize the number of workers who would realistically shift economies. Additionally, it can be legitimately argued that this figure should be less than what the most-concerned observers of European politics initially projected around the turn of the century. Any forecast of future human behavior has its methodological difficulties, of course, but this analysis addresses those issues directly and in a fashion that should give one as much confidence as possible in the soundness of its results. Therefore, the concluding chapter of this dissertation is spent discussing its policy implications and the future directions that this research could take.

## Appendix: Baseline Systems Model Equations

Note: for the sake of clarity, this information has been divided into stock and flow, converter and graphical function sections (in that order).

### Part 1: Stocks and Flows

$$\text{Average\_Bulgaria\_Education\_Level}(t) = \text{Average\_Bulgaria\_Education\_Level}(t - dt) + (\text{ch\_av\_Bulg\_ed\_level}) * dt$$

$$\text{INIT Average\_Bulgaria\_Education\_Level} = 11.157$$

$$\text{INFLOWS: ch\_av\_Bulg\_ed\_level} = \text{ROR\_Bulg\_GDP\_ch\_Bulg\_ed\_level\_ch}$$

$$\text{Average\_Czech\_Education\_Level}(t) = \text{Average\_Czech\_Education\_Level}(t - dt) + (\text{ch\_av\_Czech\_ed\_level}) * dt$$

$$\text{INIT Average\_Czech\_Education\_Level} = 12.216$$

$$\text{INFLOWS: ch\_av\_Czech\_ed\_level} = \text{ROR\_Czech\_GDP\_ch\_Czech\_ed\_level\_ch}$$

$$\text{Average\_Estonia\_Education\_Level}(t) = \text{Average\_Estonia\_Education\_Level}(t - dt) + (\text{ch\_av\_Est\_ed\_level}) * dt$$

$$\text{INIT Average\_Estonia\_Education\_Level} = 11.968$$

$$\text{INFLOWS: ch\_av\_Est\_ed\_level} = \text{ROR\_Est\_GDP\_ch\_Est\_ed\_level\_ch}$$

$$\text{Average\_Hungary\_Education\_Level}(t) = \text{Average\_Hungary\_Education\_Level}(t - dt) + (\text{ch\_av\_Hung\_ed\_level}) * dt$$

$$\text{INIT Average\_Hungary\_Education\_Level} = 11.354$$

$$\text{INFLOWS: ch\_av\_Hung\_ed\_level} = \text{ROR\_Hung\_GDP\_ch\_Hung\_ed\_level\_ch}$$

$$\text{Average\_Latvia\_Education\_Level}(t) = \text{Average\_Latvia\_Education\_Level}(t - dt) + (\text{ch\_av\_Lat\_ed\_level}) * dt$$

$$\text{INIT Average\_Latvia\_Education\_Level} = 12.517$$

$$\text{INFLOWS: ch\_av\_Lat\_ed\_level} = \text{ROR\_Lat\_GDP\_ch\_Lat\_ed\_level\_ch}$$

$$\text{Average\_Lithuania\_Education\_Level}(t) = \text{Average\_Lithuania\_Education\_Level}(t - dt) + (\text{ch\_av\_Lith\_ed\_level}) * dt$$

$$\text{INIT Average\_Lithuania\_Education\_Level} = 12.635$$

$$\text{INFLOWS: ch\_av\_Lith\_ed\_level} = \text{ROR\_Lith\_GDP\_ch\_Lith\_ed\_level\_ch}$$

$$\text{Average\_Poland\_Education\_Level}(t) = \text{Average\_Poland\_Education\_Level}(t - dt) + (\text{ch\_av\_Pol\_ed\_level}) * dt$$

$$\text{INIT Average\_Poland\_Education\_Level} = 11.781$$

$$\text{INFLOWS: ch\_av\_Pol\_ed\_level} = \text{ROR\_Pol\_GDP\_ch\_Pol\_ed\_level\_ch}$$

$$\text{Average\_Romania\_Education\_Level}(t) = \text{Average\_Romania\_Education\_Level}(t - dt) + (\text{ch\_av\_Rom\_ed\_level}) * dt$$

$$\text{INIT Average\_Romania\_Education\_Level} = 10.205$$

$$\text{INFLOWS: ch\_av\_Rom\_ed\_level} = \text{ROR\_Rom\_GDP\_ch\_Rom\_ed\_level\_ch}$$

Average\_Slovakia\_Education\_Level(t) = Average\_Slovakia\_Education\_Level(t - dt) + (ch\_av\_Svk\_ed\_level) \* dt

INIT Average\_Slovakia\_Education\_Level = 12.048

INFLOWS: ch\_av\_Svk\_ed\_level = ROR\_Svk\_GDP\_ch\_Svk\_ed\_level\_ch

Average\_Slovenia\_Education\_Level(t) = Average\_Slovenia\_Education\_Level(t - dt) + (ch\_av\_Slv\_ed\_level) \* dt

INIT Average\_Slovenia\_Education\_Level = 11.926

INFLOWS: ch\_av\_Slv\_ed\_level = ROR\_Slv\_GDP\_ch\_Slv\_ed\_level\_ch

Bulgaria\_Employment(t) = Bulgaria\_Employment(t - dt) + (ch\_Bulg\_employ) \* dt

INIT Bulgaria\_Employment = 84.9375

INFLOWS: ch\_Bulg\_employ = ROR\_Bulg\_mig\_stk\_Bulg\_employ\_ch+  
ROR\_Bulg\_GDP\_ch\_Bulg\_employ\_ch

Bulgaria\_GDP\_Ratio(t) = Bulgaria\_GDP\_Ratio(t - dt) + (ch\_Bulg\_GDP\_ratio) \* dt

INIT Bulgaria\_GDP\_Ratio = 3.04937878305192

INFLOWS: ch\_Bulg\_GDP\_ratio = -(GDP\_Bulg\_convergence\_rate-1))\*  
Bulgaria\_GDP\_Ratio

Bulgaria\_Migrant\_Stock\_Germany(t) = Bulgaria\_Migrant\_Stock\_Germany(t - dt) + (yearly\_net\_Bulg\_migrants) \* dt

INIT Bulgaria\_Migrant\_Stock\_Germany = 44300

INFLOWS: yearly\_net\_Bulg\_migrants = net\_migration\_rate\_Bulg\*Bulgaria\_Population

Bulgaria\_Population(t) = Bulgaria\_Population(t - dt) + (pop\_change\_Bulg) \* dt

INIT Bulgaria\_Population = 7824000

INFLOWS: pop\_change\_Bulg = pct\_pop\_ch\_Bulg\*Bulgaria\_Population

Czech\_Employment(t) = Czech\_Employment(t - dt) + (ch\_Czech\_employ) \* dt

INIT Czech\_Employment = 93.0125

INFLOWS: ch\_Czech\_employ = ROR\_Czech\_migstk\_Czech\_employ\_ch+  
ROR\_Czech\_GDP\_ch\_Czech\_employ\_ch

Czech\_GDP\_Ratio(t) = Czech\_GDP\_Ratio(t - dt) + (ch\_Czech\_GDP\_ratio) \* dt

INIT Czech\_GDP\_Ratio = 1.93276123170116

INFLOWS: ch\_Czech\_GDP\_ratio = -(GDP\_Czech\_convergence\_rate-1))\*  
Czech\_GDP\_Ratio

Czech\_Migrant\_Stock\_Germany(t) = Czech\_Migrant\_Stock\_Germany(t - dt) + (yearly\_net\_Czech\_migrants) \* dt

INIT Czech\_Migrant\_Stock\_Germany = 30186

INFLOWS: yearly\_net\_Czech\_migrants = net\_migration\_rate\_Czech\*Czech\_Population

Czech\_Population(t) = Czech\_Population(t - dt) + (pop\_ch\_Czech) \* dt  
INIT Czech\_Population = 10202000  
INFLOWS: pop\_ch\_Czech = pct\_pop\_ch\_Czech\*Czech\_Population

Estonia\_Employment(t) = Estonia\_Employment(t - dt) + (ch\_Est\_employ) \* dt  
INIT Estonia\_Employment = 89  
INFLOWS: ch\_Est\_employ = ROR\_Est\_migstk\_Est\_employ\_ch+  
ROR\_Est\_GDP\_ch\_Est\_employ\_ch

Estonia\_GDP\_Ratio(t) = Estonia\_GDP\_Ratio(t - dt) + (ch\_Est\_GDP\_ratio) \* dt  
INIT Estonia\_GDP\_Ratio = 1.33500697350069  
INFLOWS: ch\_Est\_GDP\_ratio = -(GDP\_Est\_convergence\_rate-1)\*  
Estonia\_GDP\_Ratio

Estonia\_Migrant\_Stock\_Germany(t) = Estonia\_Migrant\_Stock\_Germany(t - dt) +  
(yearly\_net\_Est\_migrants) \* dt  
INIT Estonia\_Migrant\_Stock\_Germany = 4220  
INFLOWS: yearly\_net\_Est\_migrants = net\_migration\_rate\_Est\*Estonia\_Population

Estonia\_Population(t) = Estonia\_Population(t - dt) + (pop\_ch\_Est) \* dt  
INIT Estonia\_Population = 1354000  
INFLOWS: pop\_ch\_Est = pct\_pop\_ch\_Est\*Estonia\_Population

Germany\_Employment(t) = Germany\_Employment(t - dt) + (ch\_German\_employ) \* dt  
INIT Germany\_Employment = 91.2125  
INFLOWS: ch\_German\_employ = ROR\_German\_GDP\_ch\_German\_employ\_ch

Hungary\_Employment(t) = Hungary\_Employment(t - dt) + (ch\_Hung\_employ) \* dt  
INIT Hungary\_Employment = 92.875  
INFLOWS: ch\_Hung\_employ = ROR\_Hung\_migstk\_Hung\_employ\_ch+  
ROR\_Hung\_GDP\_ch\_Hung\_employ\_ch

Hungary\_GDP\_Ratio(t) = Hungary\_GDP\_Ratio(t - dt) + (ch\_Hung\_GDP\_ratio) \* dt  
INIT Hungary\_GDP\_Ratio = 2.40895935573172  
INFLOWS: ch\_Hung\_GDP\_ratio = -(GDP\_Hung\_convergence\_rate-1)\*  
Hungary\_GDP\_Ratio

Hungary\_Migrant\_Stock\_Germany(t) = Hungary\_Migrant\_Stock\_Germany(t - dt) +  
(yearly\_net\_Hung\_migrants) \* dt  
INIT Hungary\_Migrant\_Stock\_Germany = 54714  
INFLOWS: yearly\_net\_Hung\_migrants = net\_migration\_rate\_Hung\*  
Hungary\_Population

Hungary\_Population(t) = Hungary\_Population(t - dt) + (pop\_ch\_Hung) \* dt  
INIT Hungary\_Population = 10130000  
INFLOWS: pop\_ch\_Hung = pct\_pop\_ch\_Hung\*Hungary\_Population

Latvia\_Employment(t) = Latvia\_Employment(t - dt) + (ch\_Lat\_employ) \* dt  
INIT Latvia\_Employment = 85.625  
INFLOWS: ch\_Lat\_employ = ROR\_Lat\_migstk\_Lat\_employ\_ch+  
ROR\_Lat\_GDP\_ch\_Lat\_employ\_ch

Latvia\_GDP\_Ratio(t) = Latvia\_GDP\_Ratio(t - dt) + (ch\_Lat\_GDP\_ratio) \* dt  
INIT Latvia\_GDP\_Ratio = 1.96914215182061  
INFLOWS: ch\_Lat\_GDP\_ratio = (-(GDP\_Lat\_convergence\_rate-1))\*Latvia\_GDP\_Ratio

Latvia\_Migrant\_Stock\_Germany(t) = Latvia\_Migrant\_Stock\_Germany(t - dt) +  
(yearly\_net\_Lat\_migrants) \* dt  
INIT Latvia\_Migrant\_Stock\_Germany = 9341  
INFLOWS: yearly\_net\_Lat\_migrants = net\_migration\_rate\_Lat\*Latvia\_Population

Latvia\_Population(t) = Latvia\_Population(t - dt) + (pop\_ch\_Lat) \* dt  
INIT Latvia\_Population = 2325000  
INFLOWS: pop\_ch\_Lat = pct\_pop\_ch\_Lat\*Latvia\_Population

Lithuania\_Employment(t) = Lithuania\_Employment(t - dt) + (ch\_Lith\_employ) \* dt  
INIT Lithuania\_Employment = 85.2125  
INFLOWS: ch\_Lith\_employ = ROR\_Lith\_migstk\_Lith\_employ\_ch+  
ROR\_Lith\_GDP\_ch\_Lith\_employ\_ch

Lithuania\_GDP\_Ratio(t) = Lithuania\_GDP\_Ratio(t - dt) + (ch\_Lith\_GDP\_ratio) \* dt  
INIT Lithuania\_GDP\_Ratio = 2.39719509140996  
INFLOWS: ch\_Lith\_GDP\_ratio = (-(GDP\_Lith\_convergence\_rate-1))\*  
Lithuania\_GDP\_Ratio

Lithuania\_Migrant\_Stock\_Germany(t) = Lithuania\_Migrant\_Stock\_Germany(t - dt) +  
(yearly\_net\_Lith\_migrants) \* dt  
INIT Lithuania\_Migrant\_Stock\_Germany = 13985  
INFLOWS: yearly\_net\_Lith\_migrants = net\_migration\_rate\_Lith\*Lithuania\_Population

Lithuania\_Population(t) = Lithuania\_Population(t - dt) + (pop\_ch\_Lith) \* dt  
INIT Lithuania\_Population = 3454000  
INFLOWS: pop\_ch\_Lith = pct\_pop\_ch\_Lith\*Lithuania\_Population

Percent\_Bulgaria\_20\_to\_34\_Population(t) = Percent\_Bulgaria\_20\_to\_34\_Population(t -  
dt) + (ch\_Bulg\_20\_to\_34\_pct) \* dt  
INIT Percent\_Bulgaria\_20\_to\_34\_Population = .2178  
INFLOWS: ch\_Bulg\_20\_to\_34\_pct = dec\_Bulg\_pct\_20\_to\_34\_pop

$\text{Percent\_Bulgaria\_College\_Migrants}(t) = \text{Percent\_Bulgaria\_College\_Migrants}(t - dt) + (\text{ch\_Bulg\_pct\_coll\_migrants}) * dt$   
 INIT Percent\_Bulgaria\_College\_Migrants = .313  
 INFLOWS: ch\_Bulg\_pct\_coll\_migrants =  
 (ROR\_Bulg\_GDP\_ch\_pct\_Bulg\_coll\_migrants\_ch/10)+  
 (ROR\_German\_GDP\_ch\_pct\_coll\_migrants\_ch/10)

$\text{Percent\_Czech\_20\_to\_34\_Population}(t) = \text{Percent\_Czech\_20\_to\_34\_Population}(t - dt) + (\text{ch\_Czech\_20\_to\_34\_pct}) * dt$   
 INIT Percent\_Czech\_20\_to\_34\_Population = .2363  
 INFLOWS: ch\_Czech\_20\_to\_34\_pct = dec\_Czech\_pct\_20\_to\_34\_pop

$\text{Percent\_Czech\_College\_Migrants}(t) = \text{Percent\_Czech\_College\_Migrants}(t - dt) + (\text{ch\_Czech\_pct\_coll\_migrants}) * dt$   
 INIT Percent\_Czech\_College\_Migrants = .356  
 INFLOWS: ch\_Czech\_pct\_coll\_migrants =  
 (ROR\_Czech\_GDP\_ch\_pct\_Czech\_coll\_migrants\_ch/10)+  
 (ROR\_German\_GDP\_ch\_pct\_coll\_migrants\_ch/10)

$\text{Percent\_Estonia\_20\_to\_34\_Population}(t) = \text{Percent\_Estonia\_20\_to\_34\_Population}(t - dt) + (\text{ch\_Est\_20\_to\_34\_pct}) * dt$   
 INIT Percent\_Estonia\_20\_to\_34\_Population = .2155  
 INFLOWS: ch\_Est\_20\_to\_34\_pct = dec\_Est\_pct\_20\_to\_34\_pop

$\text{Percent\_Estonia\_College\_Migrants}(t) = \text{Percent\_Estonia\_College\_Migrants}(t - dt) + (\text{ch\_Est\_pct\_coll\_migrants}) * dt$   
 INIT Percent\_Estonia\_College\_Migrants = .169  
 INFLOWS: ch\_Est\_pct\_coll\_migrants =  
 (ROR\_Est\_GDP\_ch\_pct\_Est\_coll\_migrants\_ch/10)+  
 (ROR\_German\_GDP\_ch\_pct\_coll\_migrants\_ch/10)

$\text{Percent\_Hungary\_20\_to\_34\_Population}(t) = \text{Percent\_Hungary\_20\_to\_34\_Population}(t - dt) + (\text{ch\_Hung\_20\_to\_34\_pct}) * dt$   
 INIT Percent\_Hungary\_20\_to\_34\_Population = .2285  
 INFLOWS: ch\_Hung\_20\_to\_34\_pct = dec\_Hung\_pct\_20\_to\_34\_pop

$\text{Percent\_Hungary\_College\_Migrants}(t) = \text{Percent\_Hungary\_College\_Migrants}(t - dt) + (\text{ch\_Hung\_pct\_coll\_migrants}) * dt$   
 INIT Percent\_Hungary\_College\_Migrants = .266  
 INFLOWS: ch\_Hung\_pct\_coll\_migrants =  
 (ROR\_Hung\_GDP\_ch\_pct\_Hung\_coll\_migrants\_ch/10)+  
 (ROR\_German\_GDP\_ch\_pct\_coll\_migrants\_ch/10)

$\text{Percent\_Latvia\_20\_to\_34\_Population}(t) = \text{Percent\_Latvia\_20\_to\_34\_Population}(t - dt) + (\text{ch\_Lat\_20\_to\_34\_pct}) * dt$   
 INIT Percent\_Latvia\_20\_to\_34\_Population = .2155  
 INFLOWS: ch\_Lat\_20\_to\_34\_pct = dec\_Lat\_pct\_20\_to\_34\_pop

$\text{Percent\_Latvia\_College\_Migrants}(t) = \text{Percent\_Latvia\_College\_Migrants}(t - dt) + (\text{ch\_Lat\_pct\_coll\_migrants}) * dt$   
 INIT Percent\_Latvia\_College\_Migrants = .113  
 INFLOWS: ch\_Lat\_pct\_coll\_migrants =  
 (ROR\_Lat\_GDP\_ch\_pct\_Lat\_coll\_migrants\_ch/10)+  
 (ROR\_German\_GDP\_ch\_pct\_coll\_migrants\_ch/10)

$\text{Percent\_Lithuania\_20\_to\_34\_Population}(t) = \text{Percent\_Lithuania\_20\_to\_34\_Population}(t - dt) + (\text{ch\_Lith\_20\_to\_34\_pct}) * dt$   
 INIT Percent\_Lithuania\_20\_to\_34\_Population = .2111  
 INFLOWS: ch\_Lith\_20\_to\_34\_pct = dec\_Lith\_pct\_20\_to\_34\_pop

$\text{Percent\_Lithuania\_College\_Migrants}(t) = \text{Percent\_Lithuania\_College\_Migrants}(t - dt) + (\text{ch\_Lith\_pct\_coll\_migrants}) * dt$   
 INIT Percent\_Lithuania\_College\_Migrants = .159  
 INFLOWS: ch\_Lith\_pct\_coll\_migrants =  
 (ROR\_Lith\_GDP\_ch\_pct\_Lith\_coll\_migrants\_ch/10)+  
 (ROR\_German\_GDP\_ch\_pct\_coll\_migrants\_ch/10)

$\text{Percent\_Poland\_20\_to\_34\_Population}(t) = \text{Percent\_Poland\_20\_to\_34\_Population}(t - dt) + (\text{ch\_Pol\_20\_to\_34\_pct}) * dt$   
 INIT Percent\_Poland\_20\_to\_34\_Population = .2389  
 INFLOWS: ch\_Pol\_20\_to\_34\_pct = dec\_Pol\_pct\_20\_to\_34\_pop

$\text{Percent\_Poland\_College\_Migrants}(t) = \text{Percent\_Poland\_College\_Migrants}(t - dt) + (\text{ch\_Pol\_pct\_coll\_migrants}) * dt$   
 INIT Percent\_Poland\_College\_Migrants = .217  
 INFLOWS: ch\_Pol\_pct\_coll\_migrants =  
 (ROR\_Pol\_GDP\_ch\_pct\_Pol\_coll\_migrants\_ch/10)+  
 (ROR\_German\_GDP\_ch\_pct\_coll\_migrants\_ch/10)

$\text{Percent\_Romania\_20\_to\_34\_Population}(t) = \text{Percent\_Romania\_20\_to\_34\_Population}(t - dt) + (\text{ch\_Rom\_20\_to\_34\_pct}) * dt$   
 INIT Percent\_Romania\_20\_to\_34\_Population = .2371  
 INFLOWS: ch\_Rom\_20\_to\_34\_pct = dec\_Rom\_pct\_20\_to\_34\_pop

$\text{Percent\_Romania\_College\_Migrants}(t) = \text{Percent\_Romania\_College\_Migrants}(t - dt) + (\text{ch\_Rom\_pct\_coll\_migrants}) * dt$   
 INIT Percent\_Romania\_College\_Migrants = .141  
 INFLOWS: ch\_Rom\_pct\_coll\_migrants =  
 (ROR\_Rom\_GDP\_ch\_pct\_Rom\_coll\_migrants\_ch/10)+  
 (ROR\_German\_GDP\_ch\_pct\_coll\_migrants\_ch/10)

$\text{Percent\_Slovakia\_20\_to\_34\_Population}(t) = \text{Percent\_Slovakia\_20\_to\_34\_Population}(t - dt) + (\text{ch\_Svk\_20\_to\_34\_pct}) * dt$   
 INIT Percent\_Slovakia\_20\_to\_34\_Population = .2493  
 INFLOWS: ch\_Svk\_20\_to\_34\_pct = dec\_Svk\_pct\_20\_to\_34\_pop

$\text{Percent\_Slovakia\_College\_Migrants}(t) = \text{Percent\_Slovakia\_College\_Migrants}(t - dt) + (\text{ch\_Svk\_pct\_coll\_migrants}) * dt$   
 INIT Percent\_Slovakia\_College\_Migrants = .158  
 INFLOWS: ch\_Svk\_pct\_coll\_migrants =  
 (ROR\_Svk\_GDP\_ch\_pct\_Svk\_coll\_migrants\_ch/10)+  
 (ROR\_German\_GDP\_ch\_pct\_coll\_migrants\_ch/10)

$\text{Percent\_Slovenia\_20\_to\_34\_Population}(t) = \text{Percent\_Slovenia\_20\_to\_34\_Population}(t - dt) + (\text{ch\_Slv\_20\_to\_34\_pct}) * dt$   
 INIT Percent\_Slovenia\_20\_to\_34\_Population = .2194  
 INFLOWS: ch\_Slv\_20\_to\_34\_pct = dec\_Slv\_pct\_20\_to\_34\_pop

$\text{Percent\_Slovenia\_College\_Migrants}(t) = \text{Percent\_Slovenia\_College\_Migrants}(t - dt) + (\text{ch\_Slv\_pct\_coll\_migrants}) * dt$   
 INIT Percent\_Slovenia\_College\_Migrants = .092  
 INFLOWS: ch\_Slv\_pct\_coll\_migrants =  
 (ROR\_Slv\_GDP\_ch\_pct\_Slv\_coll\_migrants\_ch/10)+  
 (ROR\_German\_GDP\_ch\_pct\_coll\_migrants\_ch/10)

$\text{Poland\_Employment}(t) = \text{Poland\_Employment}(t - dt) + (\text{ch\_Pol\_employ}) * dt$   
 INIT Poland\_Employment = 84.7875  
 INFLOWS: ch\_Pol\_employ = ROR\_Pol\_migstk\_Pol\_employ\_ch+  
 ROR\_Pol\_GDP\_ch\_Pol\_employ\_ch

$\text{Poland\_GDP\_Ratio}(t) = \text{Poland\_GDP\_Ratio}(t - dt) + (\text{ch\_Pol\_GDP\_ratio}) * dt$   
 INIT Poland\_GDP\_Ratio = 2.49465728433672  
 INFLOWS: ch\_Pol\_GDP\_ratio = -(GDP\_Pol\_convergence\_rate-1))\*Poland\_GDP\_Ratio

$\text{Poland\_Migrant\_Stock\_Germany}(t) = \text{Poland\_Migrant\_Stock\_Germany}(t - dt) + (\text{yearly\_net\_Pol\_migrants}) * dt$   
 INIT Poland\_Migrant\_Stock\_Germany = 326882  
 INFLOWS: yearly\_net\_Pol\_migrants = net\_migration\_rate\_Pol\*Poland\_Population

Poland\_Population(t) = Poland\_Population(t - dt) + (pop\_ch\_Pol) \* dt  
INIT Poland\_Population = 38195000  
INFLOWS: pop\_ch\_Pol = pct\_pop\_ch\_Pol\*Poland\_Population

Romania\_Employment(t) = Romania\_Employment(t - dt) + (ch\_Rom\_employ) \* dt  
INIT Romania\_Employment = 93.1375  
INFLOWS: ch\_Rom\_employ = ROR\_Rom\_migstk\_Rom\_employ\_ch+  
ROR\_Rom\_GDP\_ch\_Rom\_employ\_ch

Romania\_GDP\_Ratio(t) = Romania\_GDP\_Ratio(t - dt) + (ch\_Rom\_GDP\_ratio) \* dt  
INIT Romania\_GDP\_Ratio = 5.45413105413105  
INFLOWS: ch\_Rom\_GDP\_ratio = -(GDP\_Rom\_convergence\_rate-1)\*  
Romania\_GDP\_Ratio

Romania\_Migrant\_Stock\_Germany(t) = Romania\_Migrant\_Stock\_Germany(t - dt) +  
(yearly\_net\_Rom\_migrants) \* dt  
INIT Romania\_Migrant\_Stock\_Germany = 89104  
INFLOWS: yearly\_net\_Rom\_migrants = net\_migration\_rate\_Rom\*Romania\_Population

Romania\_Population(t) = Romania\_Population(t - dt) + (pop\_ch\_Rom) \* dt  
INIT Romania\_Population = 21734000  
INFLOWS: pop\_ch\_Rom = pct\_pop\_ch\_Rom\*Romania\_Population

Slovakia\_Employment(t) = Slovakia\_Employment(t - dt) + (ch\_Svk\_employ) \* dt  
INIT Slovakia\_Employment = 84.3125  
INFLOWS: ch\_Svk\_employ = ROR\_Svk\_migstk\_Svk\_employ\_ch+  
ROR\_Svk\_GDP\_ch\_Svk\_employ\_ch

Slovakia\_GDP\_Ratio(t) = Slovakia\_GDP\_Ratio(t - dt) + (ch\_Svk\_GDP\_ratio) \* dt  
INIT Slovakia\_GDP\_Ratio = 2.03833049403747  
INFLOWS: ch\_Svk\_GDP\_ratio = -(GDP\_Svk\_convergence\_rate-1)\*  
Slovakia\_GDP\_Ratio

Slovakia\_Migrant\_Stock\_Germany(t) = Slovakia\_Migrant\_Stock\_Germany(t - dt) +  
(yearly\_net\_Svk\_migrants) \* dt  
INIT Slovakia\_Migrant\_Stock\_Germany = 19567  
INFLOWS: yearly\_net\_Svk\_migrants = net\_migration\_rate\_Svk\*Slovakia\_Population

Slovakia\_Population(t) = Slovakia\_Population(t - dt) + (pop\_ch\_Svk) \* dt  
INIT Slovakia\_Population = 5379000  
INFLOWS: pop\_ch\_Svk = pct\_pop\_ch\_Svk\*Slovakia\_Population

Slovenia\_Employment(t) = Slovenia\_Employment(t - dt) + (ch\_Slv\_employ) \* dt  
INIT Slovenia\_Employment = 93.1125  
INFLOWS: ch\_Slv\_employ = ROR\_Slv\_migstk\_Slv\_employ\_ch+  
ROR\_Slv\_GDP\_ch\_Slv\_employ\_ch

Slovenia\_GDP\_Ratio(t) = Slovenia\_GDP\_Ratio(t - dt) + (ch\_Slv\_GDP\_ratio) \* dt  
INIT Slovenia\_GDP\_Ratio = 1.36791711325473  
INFLOWS: ch\_Slv\_GDP\_ratio = (-(GDP\_Slv\_convergence\_rate-1))\*  
Slovenia\_GDP\_Ratio

Slovenia\_Migrant\_Stock\_Germany(t) = Slovenia\_Migrant\_Stock\_Germany(t - dt) +  
(yearly\_net\_Slv\_migrants) \* dt  
INIT Slovenia\_Migrant\_Stock\_Germany = 21795  
INFLOWS: yearly\_net\_Slv\_migrants = net\_migration\_rate\_Slv\*Slovenia\_Population

Slovenia\_Population(t) = Slovenia\_Population(t - dt) + (pop\_ch\_Slv) \* dt  
INIT Slovenia\_Population = 1997000  
INFLOWS: pop\_ch\_Slv = pct\_pop\_ch\_Slv\*Slovenia\_Population

Total\_Bulgarian\_Net\_College\_Migrants\_to\_2030(t) =  
Total\_Bulgarian\_Net\_College\_Migrants\_to\_2030(t - dt) +  
(ch\_tot\_Bulg\_net\_coll\_migrants) \* dt  
INIT Total\_Bulgarian\_Net\_College\_Migrants\_to\_2030 = 0  
INFLOWS: ch\_tot\_Bulg\_net\_coll\_migrants = yearly\_net\_Bulg\_coll\_migrants

Total\_Bulgarian\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030(t) =  
Total\_Bulgarian\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030(t - dt) +  
(ch\_tot\_Bulg\_net\_migrants\_age\_20\_to\_34) \* dt  
INIT Total\_Bulgarian\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030 = 0  
INFLOWS: ch\_tot\_Bulg\_net\_migrants\_age\_20\_to\_34 =  
yearly\_Bulg\_net\_migrants\_age\_20\_to\_34

Total\_Bulgarian\_Net\_Migrants\_to\_2030(t) = Total\_Bulgarian\_Net\_Migrants\_to\_2030(t -  
dt) + (ch\_tot\_Bulg\_net\_migrants) \* dt  
INIT Total\_Bulgarian\_Net\_Migrants\_to\_2030 = 0  
INFLOWS: ch\_tot\_Bulg\_net\_migrants = yearly\_net\_Bulg\_migrants

Total\_Czech\_Net\_College\_Migrants\_to\_2030(t) =  
Total\_Czech\_Net\_College\_Migrants\_to\_2030(t - dt) +  
(ch\_tot\_Czech\_net\_coll\_migrants) \* dt  
INIT Total\_Czech\_Net\_College\_Migrants\_to\_2030 = 0  
INFLOWS: ch\_tot\_Czech\_net\_coll\_migrants = yearly\_net\_Czech\_coll\_migrants

Total\_Czech\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030(t) =  
Total\_Czech\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030(t - dt) +  
(ch\_tot\_Czech\_net\_migrants\_age\_20\_to\_34) \* dt  
INIT Total\_Czech\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030 = 0  
INFLOWS: ch\_tot\_Czech\_net\_migrants\_age\_20\_to\_34 =  
yearly\_Czech\_net\_migrants\_age\_20\_to\_34

$Total\_Czech\_Net\_Migrants\_to\_2030(t) = Total\_Czech\_Net\_Migrants\_to\_2030(t - dt) + (ch\_tot\_Czech\_net\_migrants) * dt$   
 INIT  $Total\_Czech\_Net\_Migrants\_to\_2030 = 0$   
 INFLOWS:  $ch\_tot\_Czech\_net\_migrants = yearly\_net\_Czech\_migrants$

$Total\_Estonian\_Net\_College\_Migrants\_to\_2030(t) = Total\_Estonian\_Net\_College\_Migrants\_to\_2030(t - dt) + (ch\_tot\_Est\_net\_coll\_migrants) * dt$   
 INIT  $Total\_Estonian\_Net\_College\_Migrants\_to\_2030 = 0$   
 INFLOWS:  $ch\_tot\_Est\_net\_coll\_migrants = yearly\_net\_Est\_coll\_migrants$

$Total\_Estonian\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030(t) = Total\_Estonian\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030(t - dt) + (ch\_tot\_Est\_net\_migrants\_age\_20\_to\_34) * dt$   
 INIT  $Total\_Estonian\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030 = 0$   
 INFLOWS:  $ch\_tot\_Est\_net\_migrants\_age\_20\_to\_34 = yearly\_Est\_net\_migrants\_age\_20\_to\_34$

$Total\_Estonian\_Net\_Migrants\_to\_2030(t) = Total\_Estonian\_Net\_Migrants\_to\_2030(t - dt) + (ch\_tot\_Est\_net\_migrants) * dt$   
 INIT  $Total\_Estonian\_Net\_Migrants\_to\_2030 = 0$   
 INFLOWS:  $ch\_tot\_Est\_net\_migrants = yearly\_net\_Est\_migrants$

$Total\_Hungarian\_Net\_College\_Migrants\_to\_2030(t) = Total\_Hungarian\_Net\_College\_Migrants\_to\_2030(t - dt) + (ch\_tot\_Hung\_net\_coll\_migrants) * dt$   
 INIT  $Total\_Hungarian\_Net\_College\_Migrants\_to\_2030 = 0$   
 INFLOWS:  $ch\_tot\_Hung\_net\_coll\_migrants = yearly\_net\_Hung\_coll\_migrants$

$Total\_Hungarian\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030(t) = Total\_Hungarian\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030(t - dt) + (ch\_tot\_Hung\_net\_migrants\_age\_20\_to\_34) * dt$   
 INIT  $Total\_Hungarian\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030 = 0$   
 INFLOWS:  $ch\_tot\_Hung\_net\_migrants\_age\_20\_to\_34 = yearly\_Hung\_net\_migrants\_age\_20\_to\_34$

$Total\_Hungarian\_Net\_Migrants\_to\_2030(t) = Total\_Hungarian\_Net\_Migrants\_to\_2030(t - dt) + (ch\_tot\_Hung\_net\_migrants) * dt$   
 INIT  $Total\_Hungarian\_Net\_Migrants\_to\_2030 = 0$   
 INFLOWS:  $ch\_tot\_Hung\_net\_migrants = yearly\_net\_Hung\_migrants$

$Total\_Latvian\_Net\_College\_Migrants\_to\_2030(t) = Total\_Latvian\_Net\_College\_Migrants\_to\_2030(t - dt) + (ch\_tot\_Lat\_coll\_migrants) * dt$   
 INIT  $Total\_Latvian\_Net\_College\_Migrants\_to\_2030 = 0$   
 INFLOWS:  $ch\_tot\_Lat\_coll\_migrants = yearly\_net\_Lat\_coll\_migrants$

$Total\_Latvian\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030(t) =$   
 $Total\_Latvian\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030(t - dt) +$   
 $(ch\_tot\_Lat\_net\_migrants\_age\_20\_to\_34) * dt$   
 $INIT\ Total\_Latvian\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030 = 0$   
 $INFLOWS: ch\_tot\_Lat\_net\_migrants\_age\_20\_to\_34 =$   
 $yearly\_Lat\_net\_migrants\_age\_20\_to\_34$

$Total\_Latvian\_Net\_Migrants\_to\_2030(t) = Total\_Latvian\_Net\_Migrants\_to\_2030(t - dt)$   
 $+ (ch\_tot\_Lat\_net\_migrants) * dt$   
 $INIT\ Total\_Latvian\_Net\_Migrants\_to\_2030 = 0$   
 $INFLOWS: ch\_tot\_Lat\_net\_migrants = yearly\_net\_Lat\_migrants$

$Total\_Lithuanian\_Net\_College\_Migrants\_to\_2030(t) =$   
 $Total\_Lithuanian\_Net\_College\_Migrants\_to\_2030(t - dt) +$   
 $(ch\_tot\_Lith\_net\_coll\_migrants) * dt$   
 $INIT\ Total\_Lithuanian\_Net\_College\_Migrants\_to\_2030 = 0$   
 $INFLOWS: ch\_tot\_Lith\_net\_coll\_migrants = yearly\_net\_Lith\_coll\_migrants$

$Total\_Lithuanian\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030(t) =$   
 $Total\_Lithuanian\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030(t - dt) +$   
 $(ch\_tot\_Lith\_net\_migrants\_age\_20\_to\_34) * dt$   
 $INIT\ Total\_Lithuanian\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030 = 0$   
 $INFLOWS: ch\_tot\_Lith\_net\_migrants\_age\_20\_to\_34 =$   
 $yearly\_Lith\_net\_migrants\_age\_20\_to\_34$

$Total\_Lithuanian\_Net\_Migrants\_to\_2030(t) =$   
 $Total\_Lithuanian\_Net\_Migrants\_to\_2030(t - dt) + (ch\_tot\_Lith\_net\_migrants) * dt$   
 $INIT\ Total\_Lithuanian\_Net\_Migrants\_to\_2030 = 0$   
 $INFLOWS: ch\_tot\_Lith\_net\_migrants = yearly\_net\_Lith\_migrants$

$Total\_Polish\_Net\_College\_Migrants\_to\_2030(t) =$   
 $Total\_Polish\_Net\_College\_Migrants\_to\_2030(t - dt) +$   
 $(ch\_tot\_Pol\_net\_coll\_migrants)*dt$   
 $INIT\ Total\_Polish\_Net\_College\_Migrants\_to\_2030 = 0$   
 $INFLOWS: ch\_tot\_Pol\_net\_coll\_migrants = yearly\_net\_Pol\_coll\_migrants$

$Total\_Polish\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030(t) =$   
 $Total\_Polish\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030(t - dt) +$   
 $(ch\_tot\_Pol\_net\_migrants\_age\_20\_to\_34) * dt$   
 $INIT\ Total\_Polish\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030 = 0$   
 $INFLOWS: ch\_tot\_Pol\_net\_migrants\_age\_20\_to\_34 =$   
 $yearly\_Pol\_net\_migrants\_age\_20\_to\_34$

Total\_Polish\_Net\_Migrants\_to\_2030(t) = Total\_Polish\_Net\_Migrants\_to\_2030(t - dt) +  
(ch\_tot\_Pol\_net\_migrants) \* dt  
INIT Total\_Polish\_Net\_Migrants\_to\_2030 = 0  
INFLOWS: ch\_tot\_Pol\_net\_migrants = yearly\_net\_Pol\_migrants

Total\_Romanian\_Net\_College\_Migrants\_to\_2030(t) =  
Total\_Romanian\_Net\_College\_Migrants\_to\_2030(t - dt) +  
(ch\_tot\_Rom\_net\_coll\_migrants) \* dt  
INIT Total\_Romanian\_Net\_College\_Migrants\_to\_2030 = 0  
INFLOWS: ch\_tot\_Rom\_net\_coll\_migrants = yearly\_net\_Rom\_coll\_migrants

Total\_Romanian\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030(t) =  
Total\_Romanian\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030(t - dt) +  
(ch\_tot\_Rom\_net\_migrants\_age\_20\_to\_34) \* dt  
INIT Total\_Romanian\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030 = 0  
INFLOWS: ch\_tot\_Rom\_net\_migrants\_age\_20\_to\_34 =  
yearly\_Rom\_net\_migrants\_age\_20\_to\_34

Total\_Romanian\_Net\_Migrants\_to\_2030(t) = Total\_Romanian\_Net\_Migrants\_to\_2030(t  
- dt) + (ch\_tot\_Rom\_net\_migrants) \* dt  
INIT Total\_Romanian\_Net\_Migrants\_to\_2030 = 0  
INFLOWS: ch\_tot\_Rom\_net\_migrants = yearly\_net\_Rom\_migrants

Total\_Slovak\_Net\_College\_Migrants\_to\_2030(t) =  
Total\_Slovak\_Net\_College\_Migrants\_to\_2030(t - dt) +  
(ch\_tot\_Svk\_net\_coll\_migrants)\*dt  
INIT Total\_Slovak\_Net\_College\_Migrants\_to\_2030 = 0  
INFLOWS: ch\_tot\_Svk\_net\_coll\_migrants = yearly\_net\_Svk\_coll\_migrants

Total\_Slovak\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030(t) =  
Total\_Slovak\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030(t - dt) +  
(ch\_tot\_Svk\_net\_migrants\_age\_20\_to\_34) \* dt  
INIT Total\_Slovak\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030 = 0  
INFLOWS: ch\_tot\_Svk\_net\_migrants\_age\_20\_to\_34 =  
yearly\_Svk\_net\_migrants\_age\_20\_to\_34

Total\_Slovak\_Net\_Migrants\_to\_2030(t) = Total\_Slovak\_Net\_Migrants\_to\_2030(t - dt) +  
(ch\_tot\_Svk\_net\_migrants) \* dt  
INIT Total\_Slovak\_Net\_Migrants\_to\_2030 = 0  
INFLOWS: ch\_tot\_Svk\_net\_migrants = yearly\_net\_Svk\_migrants

Total\_Slovene\_Net\_College\_Migrants\_to\_2030(t) =  
Total\_Slovene\_Net\_College\_Migrants\_to\_2030(t - dt) +  
(ch\_tot\_Slv\_net\_college\_migrants) \* dt  
INIT Total\_Slovene\_Net\_College\_Migrants\_to\_2030 = 0  
INFLOWS: ch\_tot\_Slv\_net\_college\_migrants = yearly\_net\_Slv\_coll\_migrants

$$\text{Total\_Slovene\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030}(t) =$$

$$\text{Total\_Slovene\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030}(t - dt) +$$

$$(\text{ch\_tot\_Slv\_net\_migrants\_age\_20\_to\_34}) * dt$$

$$\text{INIT Total\_Slovene\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030} = 0$$

$$\text{INFLOWS: ch\_tot\_Slv\_net\_migrants\_age\_20\_to\_34} =$$

$$\text{yearly\_Slv\_net\_migrants\_age\_20\_to\_34}$$

$$\text{Total\_Slovene\_Net\_Migrants\_to\_2030}(t) = \text{Total\_Slovene\_Net\_Migrants\_to\_2030}(t - dt)$$

$$+ (\text{ch\_tot\_Slv\_net\_migrants}) * dt$$

$$\text{INIT Total\_Slovene\_Net\_Migrants\_to\_2030} = 0$$

$$\text{INFLOWS: ch\_tot\_Slv\_net\_migrants} = \text{yearly\_net\_Slv\_migrants}$$

*Part 2: Converters*

$\text{age\_disproportionate\_factor} = 3$

$$\text{CEEC10\_total\_net\_college\_migrants\_to\_Germany} =$$

$$\text{Total\_Bulgarian\_Net\_College\_Migrants\_to\_2030} + \text{Total\_Czech\_Net\_College\_Migrants\_to\_2030}$$

$$+ \text{Total\_Estonian\_Net\_College\_Migrants\_to\_2030} + \text{Total\_Hungarian\_Net\_College\_Migrants\_to\_2030}$$

$$+ \text{Total\_Latvian\_Net\_College\_Migrants\_to\_2030} + \text{Total\_Lithuanian\_Net\_College\_Migrants\_to\_2030}$$

$$+ \text{Total\_Polish\_Net\_College\_Migrants\_to\_2030} + \text{Total\_Romanian\_Net\_College\_Migrants\_to\_2030}$$

$$+ \text{Total\_Slovak\_Net\_College\_Migrants\_to\_2030} + \text{Total\_Slovene\_Net\_College\_Migrants\_to\_2030}$$

$$\text{CEEC10\_total\_net\_migrants\_age\_20\_to\_34} =$$

$$\text{Total\_Bulgarian\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030} + \text{Total\_Czech\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030}$$

$$+ \text{Total\_Estonian\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030} + \text{Total\_Hungarian\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030}$$

$$+ \text{Total\_Latvian\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030} + \text{Total\_Lithuanian\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030}$$

$$+ \text{Total\_Polish\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030} + \text{Total\_Romanian\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030}$$

$$+ \text{Total\_Slovak\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030} + \text{Total\_Slovene\_Net\_Migrants\_Age\_20\_to\_34\_to\_2030}$$

$$\text{CEEC10\_total\_net\_migrants\_to\_Germany} =$$

$$\text{Total\_Bulgarian\_Net\_Migrants\_to\_2030} + \text{Total\_Czech\_Net\_Migrants\_to\_2030} + \text{Total\_Estonian\_Net\_Migrants\_to\_2030}$$

$$+ \text{Total\_Hungarian\_Net\_Migrants\_to\_2030} + \text{Total\_Latvian\_Net\_Migrants\_to\_2030} + \text{Total\_Lithuanian\_Net\_Migrants\_to\_2030}$$

$$+ \text{Total\_Polish\_Net\_Migrants\_to\_2030} + \text{Total\_Romanian\_Net\_Migrants\_to\_2030} + \text{Total\_Slovak\_Net\_Migrants\_to\_2030}$$

$$+ \text{Total\_Slovene\_Net\_Migrants\_to\_2030}$$

$\text{ch\_Bulg\_GDP} = 1.034382 + \text{ROR\_av\_Bulg\_ed\_level\_Bulg\_GDP\_ch}$

$\text{ch\_Czech\_GDP} = 1.034382 + \text{ROR\_av\_Czech\_ed\_level\_Czech\_GDP\_ch}$

$\text{ch\_Est\_GDP} = 1.034382 + \text{ROR\_av\_Est\_ed\_level\_Est\_GDP\_ch}$

$ch\_German\_GDP = 1.0141$   
 $ch\_Hung\_GDP = 1.034382 + ROR\_av\_Hung\_ed\_level\_Hung\_GDP\_ch$   
 $ch\_Lat\_GDP = 1.034382 + ROR\_av\_Lat\_ed\_level\_Lat\_GDP\_ch$   
 $ch\_Lith\_GDP = 1.034382 + ROR\_av\_Lith\_ed\_level\_Lith\_GDP\_ch$   
 $ch\_Pol\_GDP = 1.034382 + ROR\_av\_Pol\_ed\_level\_Pol\_GDP\_ch$   
 $ch\_Rom\_GDP = 1.034382 + ROR\_av\_Rom\_ed\_level\_Rom\_GDP\_ch$   
 $ch\_Slv\_GDP = 1.034382 + ROR\_av\_Slv\_ed\_level\_Slv\_GDP\_ch$   
 $ch\_Svk\_GDP = 1.034382 + ROR\_av\_Svk\_ed\_level\_Svk\_GDP\_ch$   
 $dec\_Bulg\_pct\_20\_to\_34\_pop = -.002800$   
 $dec\_Czech\_pct\_20\_to\_34\_pop = -.003252$   
 $dec\_Est\_pct\_20\_to\_34\_pop = -.002056$   
 $dec\_Hung\_pct\_20\_to\_34\_pop = -.002568$   
 $dec\_Lat\_pct\_20\_to\_34\_pop = -.002820$   
 $dec\_Lith\_pct\_20\_to\_34\_pop = -.002336$   
 $dec\_Pol\_pct\_20\_to\_34\_pop = -.003460$   
 $dec\_Rom\_pct\_20\_to\_34\_pop = -.003116$   
 $dec\_Slv\_pct\_20\_to\_34\_pop = -.002672$   
 $dec\_Svk\_pct\_20\_to\_34\_pop = -.003612$   
 $free\_migration\_policy? = IF(TIME < 2011) THEN 0 ELSE 1$   
 $GDP\_Bulg\_convergence\_rate = ch\_Bulg\_GDP / ch\_German\_GDP$   
 $GDP\_Czech\_convergence\_rate = ch\_Czech\_GDP / ch\_German\_GDP$   
 $GDP\_Est\_convergence\_rate = ch\_Est\_GDP / ch\_German\_GDP$   
 $GDP\_Hung\_convergence\_rate = ch\_Hung\_GDP / ch\_German\_GDP$

GDP\_Lat\_convergence\_rate = ch\_Lat\_GDP/ch\_German\_GDP

GDP\_Lith\_convergence\_rate = ch\_Lith\_GDP/ch\_German\_GDP

GDP\_Pol\_convergence\_rate = ch\_Pol\_GDP/ch\_German\_GDP

GDP\_Rom\_convergence\_rate = ch\_Rom\_GDP/ch\_German\_GDP

GDP\_Slv\_convergence\_rate = ch\_Slv\_GDP/ch\_German\_GDP

GDP\_Svk\_convergence\_rate = ch\_Svk\_GDP/ch\_German\_GDP

net\_migration\_rate\_Bulg = (0.00595407870156363\*per\_capita\_Bulg\_mig\_stk) +  
(0.000100377268106815\*LOGN(Bulgaria\_GDP\_Ratio))+  
(0.00100030142107599\*LOGN(Germany\_Employment))+  
(-0.000965588821154321\*LOGN(Bulgaria\_Employment))+  
(0.0000131907879702328\*free\_migration\_policy?)+  
(ROR\_av\_Bulg\_ed\_level\_Bulg\_mig\_rate/10000)+  
(ROR\_Bulg\_20\_to\_34\_pop\_Bulg\_mig\_rate/10000)

net\_migration\_rate\_Czech = (0.00595407870156363\*per\_capita\_Czech\_mig\_stk)+  
(0.000100377268106815\*LOGN(Czech\_GDP\_Ratio))+  
(0.00100030142107599\*LOGN(Germany\_Employment))+  
(-0.000965588821154321\*LOGN(Czech\_Employment))+  
(0.0000131907879702328\*free\_migration\_policy?)+  
(ROR\_av\_Czech\_ed\_level\_Czech\_mig\_rate/10000)+  
(ROR\_Czech\_20\_to\_34\_pop\_Czech\_mig\_rate/10000)

net\_migration\_rate\_Est = (0.00595407870156363\*per\_capita\_Est\_mig\_stk)+  
(0.000100377268106815\*LOGN(Estonia\_GDP\_Ratio))+  
(0.00100030142107599\*LOGN(Germany\_Employment))+  
(-0.000965588821154321\*LOGN(Estonia\_Employment))+  
(0.0000131907879702328\*free\_migration\_policy?)+  
(ROR\_av\_Est\_ed\_level\_Est\_mig\_rate/10000)+  
(ROR\_Est\_20\_to\_34\_pop\_Est\_mig\_rate/10000)

net\_migration\_rate\_Hung = (0.00595407870156363\*per\_capita\_Hung\_mig\_stk)+  
(0.000100377268106815\*LOGN(Hungary\_GDP\_Ratio))+  
(0.00100030142107599\*LOGN(Germany\_Employment))+  
(-0.000965588821154321\*LOGN(Hungary\_Employment))+  
(0.0000131907879702328\*free\_migration\_policy?)+  
(ROR\_av\_Hung\_ed\_level\_Hung\_mig\_rate/10000)+  
(ROR\_Hung\_20\_to\_34\_pop\_Hung\_mig\_rate/10000)

net\_migration\_rate\_Lat = (0.00595407870156363\*per\_capita\_Lat\_mig\_stk)+  
(0.000100377268106815\*LOGN(Latvia\_GDP\_Ratio))+  
(0.00100030142107599\*LOGN(Germany\_Employment))+  
(-0.000965588821154321\*LOGN(Latvia\_Employment))+  
(0.0000131907879702328\*free\_migration\_policy?)+  
(ROR\_av\_Lat\_ed\_level\_\_Lat\_mig\_rate/10000)+  
(ROR\_Lat\_20\_to\_34\_pop\_Lat\_mig\_rate/10000)

net\_migration\_rate\_Lith = (0.00595407870156363\*per\_capita\_Lith\_mig\_stk)+  
(0.000100377268106815\*LOGN(Lithuania\_GDP\_Ratio))+  
(0.00100030142107599\*LOGN(Germany\_Employment))+  
(-0.000965588821154321\*LOGN(Lithuania\_Employment))+  
(0.0000131907879702328\*free\_migration\_policy?)+  
(ROR\_av\_Lith\_ed\_level\_Lith\_mig\_rate/10000)+  
(ROR\_Lith\_20\_to\_34\_pop\_Lith\_mig\_rate/10000)

net\_migration\_rate\_Pol = (0.00595407870156363\*per\_capita\_Pol\_mig\_stk)+  
(0.000100377268106815\*LOGN(Poland\_GDP\_Ratio))+  
(0.00100030142107599\*LOGN(Germany\_Employment))+  
(-0.000965588821154321\*LOGN(Poland\_Employment))+  
(0.0000131907879702328\*free\_migration\_policy?)+  
(ROR\_av\_Pol\_ed\_level\_\_Pol\_mig\_rate/10000)+  
(ROR\_Pol\_20\_to\_34\_pop\_Pol\_mig\_rate/10000)

net\_migration\_rate\_Rom = (0.00595407870156363\*per\_capita\_Rom\_mig\_stk)+  
(0.000100377268106815\*LOGN(Romania\_GDP\_Ratio))+  
(0.00100030142107599\*LOGN(Germany\_Employment))+  
(-0.000965588821154321\*LOGN(Romania\_Employment))+  
(0.0000131907879702328\*free\_migration\_policy?)+  
(ROR\_av\_Rom\_ed\_level\_\_Rom\_mig\_rate/10000)+  
(ROR\_Rom\_20\_to\_34\_pop\_Rom\_mig\_rate/10000)

net\_migration\_rate\_Slv = (0.00595407870156363\*per\_capita\_Slv\_mig\_stk)+  
(0.000100377268106815\*LOGN(Slovenia\_GDP\_Ratio))+  
(0.00100030142107599\*LOGN(Germany\_Employment))+  
(-0.000965588821154321\*LOGN(Slovenia\_Employment))+  
(0.0000131907879702328\*free\_migration\_policy?)+  
(ROR\_av\_Slv\_ed\_level\_\_Slv\_mig\_rate/10000)+  
(ROR\_Slv\_20\_to\_34\_pop\_Slv\_mig\_rate/10000)

net\_migration\_rate\_Svk = (0.00595407870156363\*per\_capita\_Svk\_mig\_stk)+  
(0.000100377268106815\*LOGN(Slovakia\_GDP\_Ratio))+  
(0.00100030142107599\*LOGN(Germany\_Employment))+  
(-0.000965588821154321\*LOGN(Slovakia\_Employment))+  
(0.0000131907879702328\*free\_migration\_policy?)+  
(ROR\_av\_Svk\_ed\_level\_\_Svk\_mig\_rate/10000)+  
(ROR\_Svk\_20\_to\_34\_pop\_Svk\_mig\_rate/10000)

pct\_pop\_ch\_Bulg = -.00850

pct\_pop\_ch\_Czech = -.00133

pct\_pop\_ch\_Est = -.00283

pct\_pop\_ch\_Hung = -.00333

pct\_pop\_ch\_Lat = -.00517

pct\_pop\_ch\_Lith = -.00500

pct\_pop\_ch\_Pol = -.00400

pct\_pop\_ch\_Rom = -.00617

pct\_pop\_ch\_Slv = -.00250

pct\_pop\_ch\_Svk = -.00200

per\_capita\_Bulg\_mig\_stk = Bulgaria\_Migrant\_Stock\_Germany/Bulgaria\_Population

per\_capita\_Czech\_mig\_stk = Czech\_Migrant\_Stock\_Germany/Czech\_Population

per\_capita\_Est\_mig\_stk = Estonia\_Migrant\_Stock\_Germany/Estonia\_Population

per\_capita\_Hung\_mig\_stk = Hungary\_Migrant\_Stock\_Germany/Hungary\_Population

per\_capita\_Lat\_mig\_stk = Latvia\_Migrant\_Stock\_Germany/Latvia\_Population

per\_capita\_Lith\_mig\_stk = Lithuania\_Migrant\_Stock\_Germany/Lithuania\_Population

per\_capita\_Pol\_mig\_stk = Poland\_Migrant\_Stock\_Germany/Poland\_Population

per\_capita\_Rom\_mig\_stk = Romania\_Migrant\_Stock\_Germany/Romania\_Population

per\_capita\_Slv\_mig\_stk = Slovenia\_Migrant\_Stock\_Germany/Slovenia\_Population

$per\_capita\_Svk\_mig\_stk = Slovakia\_Migrant\_Stock\_Germany/Slovakia\_Population$

$yearly\_Bulg\_net\_migrants\_age\_20\_to\_34 = (age\_disproportionate\_factor*Percent\_Bulgaria\_20\_to\_34\_Population)*yearly\_net\_Bulg\_migrants$

$yearly\_Czech\_net\_migrants\_age\_20\_to\_34 = (age\_disproportionate\_factor*Percent\_Czech\_20\_to\_34\_Population)*yearly\_net\_Czech\_migrants$

$yearly\_Est\_net\_migrants\_age\_20\_to\_34 = (age\_disproportionate\_factor*Percent\_Estonia\_20\_to\_34\_Population)*yearly\_net\_Est\_migrants$

$yearly\_Hung\_net\_migrants\_age\_20\_to\_34 = (age\_disproportionate\_factor*Percent\_Hungary\_20\_to\_34\_Population)*yearly\_net\_Hung\_migrants$

$yearly\_Lat\_net\_migrants\_age\_20\_to\_34 = (age\_disproportionate\_factor*Percent\_Latvia\_20\_to\_34\_Population)*yearly\_net\_Lat\_migrants$

$yearly\_Lith\_net\_migrants\_age\_20\_to\_34 = (age\_disproportionate\_factor*Percent\_Lithuania\_20\_to\_34\_Population)*yearly\_net\_Lith\_migrants$

$yearly\_net\_Bulg\_coll\_migrants = Percent\_Bulgaria\_College\_Migrants*yearly\_net\_Bulg\_migrants$

$yearly\_net\_Czech\_coll\_migrants = Percent\_Czech\_College\_Migrants*yearly\_net\_Czech\_migrants$

$yearly\_net\_Est\_coll\_migrants = Percent\_Estonia\_College\_Migrants*yearly\_net\_Est\_migrants$

$yearly\_net\_Hung\_coll\_migrants = Percent\_Hungary\_College\_Migrants*yearly\_net\_Hung\_migrants$

$yearly\_net\_Lat\_coll\_migrants = Percent\_Latvia\_College\_Migrants*yearly\_net\_Lat\_migrants$

$yearly\_net\_Lith\_coll\_migrants = Percent\_Lithuania\_College\_Migrants*yearly\_net\_Lith\_migrants$

$yearly\_net\_Pol\_coll\_migrants = Percent\_Poland\_College\_Migrants*yearly\_net\_Pol\_migrants$

$yearly\_net\_Rom\_coll\_migrants = Percent\_Romania\_College\_Migrants*yearly\_net\_Rom\_migrants$

$yearly\_net\_Slv\_coll\_migrants = Percent\_Slovenia\_College\_Migrants*yearly\_net\_Slv\_migrants$

yearly\_net\_Svk\_coll\_migrants =  
Percent\_Slovakia\_College\_Migrants\*yearly\_net\_Svk\_migrants

yearly\_Pol\_net\_migrants\_age\_20\_to\_34 = (age\_disproportionate\_factor\*  
Percent\_Poland\_20\_to\_34\_Population)\*yearly\_net\_Pol\_migrants

yearly\_Rom\_net\_migrants\_age\_20\_to\_34 = (age\_disproportionate\_factor\*  
Percent\_Romania\_20\_to\_34\_Population)\*yearly\_net\_Rom\_migrants

yearly\_Slv\_net\_migrants\_age\_20\_to\_34 = (age\_disproportionate\_factor\*  
Percent\_Slovenia\_20\_to\_34\_Population)\*yearly\_net\_Slv\_migrants

yearly\_Svk\_net\_migrants\_age\_20\_to\_34 = (age\_disproportionate\_factor\*  
Percent\_Slovakia\_20\_to\_34\_Population)\*yearly\_net\_Svk\_migrants

### *Part 3: Graphical Functions*

ROR\_av\_Bulg\_ed\_level\_Bulg\_GDP\_ch =  
GRAPH(Average\_Bulgaria\_Education\_Level)  
(0.00, -0.012), (1.00, -0.011), (2.00, -0.01), (3.00, -0.009), (4.00, -0.008), (5.00, -0.007),  
(6.00, -0.006), (7.00, -0.005), (8.00, -0.004), (9.00, -0.003), (10.0, -0.002), (11.0, -0.001),  
(12.0, 0.00), (13.0, 0.001), (14.0, 0.002), (15.0, 0.003), (16.0, 0.004), (17.0, 0.005),  
(18.0, 0.006), (19.0, 0.007), (20.0, 0.008), (21.0, 0.009), (22.0, 0.01), (23.0, 0.011),  
(24.0, 0.012), (25.0, 0.013), (26.0, 0.014), (27.0, 0.015), (28.0, 0.016), (29.0, 0.017),  
(30.0, 0.018)

ROR\_av\_Bulg\_ed\_level\_Bulg\_mig\_rate =  
GRAPH(Average\_Bulgaria\_Education\_Level)  
(0.00, -0.12), (1.00, -0.11), (2.00, -0.1), (3.00, -0.09), (4.00, -0.08), (5.00, -0.07),  
(6.00, -0.06), (7.00, -0.05), (8.00, -0.04), (9.00, -0.03), (10.0, -0.02), (11.0, -0.01),  
(12.0, 0.00), (13.0, 0.01), (14.0, 0.02), (15.0, 0.03), (16.0, 0.04), (17.0, 0.05), (18.0, 0.06),  
(19.0, 0.07), (20.0, 0.08), (21.0, 0.09), (22.0, 0.1), (23.0, 0.11), (24.0, 0.12), (25.0, 0.13),  
(26.0, 0.14), (27.0, 0.15), (28.0, 0.16), (29.0, 0.17), (30.0, 0.18)

ROR\_av\_Czech\_ed\_level\_Czech\_GDP\_ch =  
GRAPH(Average\_Czech\_Education\_Level)  
(0.00, -0.012), (1.00, -0.011), (2.00, -0.01), (3.00, -0.009), (4.00, -0.008), (5.00, -0.007),  
(6.00, -0.006), (7.00, -0.005), (8.00, -0.004), (9.00, -0.003), (10.0, -0.002), (11.0, -0.001),  
(12.0, 0.00), (13.0, 0.001), (14.0, 0.002), (15.0, 0.003), (16.0, 0.004), (17.0, 0.005),  
(18.0, 0.006), (19.0, 0.007), (20.0, 0.008), (21.0, 0.009), (22.0, 0.01), (23.0, 0.011),  
(24.0, 0.012), (25.0, 0.013), (26.0, 0.014), (27.0, 0.015), (28.0, 0.016), (29.0, 0.017),  
(30.0, 0.018)

ROR\_av\_Czech\_ed\_level\_Czech\_mig\_rate =  
GRAPH(Average\_Czech\_Education\_Level)  
(0.00, -0.12), (1.00, -0.11), (2.00, -0.1), (3.00, -0.09), (4.00, -0.08), (5.00, -0.07),  
(6.00, -0.06), (7.00, -0.05), (8.00, -0.04), (9.00, -0.03), (10.0, -0.02), (11.0, -0.01),  
(12.0, 0.00), (13.0, 0.01), (14.0, 0.02), (15.0, 0.03), (16.0, 0.04), (17.0, 0.05), (18.0, 0.06),  
(19.0, 0.07), (20.0, 0.08), (21.0, 0.09), (22.0, 0.1), (23.0, 0.11), (24.0, 0.12), (25.0, 0.13),  
(26.0, 0.14), (27.0, 0.15), (28.0, 0.16), (29.0, 0.17), (30.0, 0.18)

ROR\_av\_Est\_ed\_level\_Est\_GDP\_ch = GRAPH(Average\_Estonia\_Education\_Level)  
(0.00, -0.012), (1.00, -0.011), (2.00, -0.01), (3.00, -0.009), (4.00, -0.008), (5.00, -0.007),  
(6.00, -0.006), (7.00, -0.005), (8.00, -0.004), (9.00, -0.003), (10.0, -0.002), (11.0, -0.001),  
(12.0, 0.00), (13.0, 0.001), (14.0, 0.002), (15.0, 0.003), (16.0, 0.004), (17.0, 0.005),  
(18.0, 0.006), (19.0, 0.007), (20.0, 0.008), (21.0, 0.009), (22.0, 0.01), (23.0, 0.011),  
(24.0, 0.012), (25.0, 0.013), (26.0, 0.014), (27.0, 0.015), (28.0, 0.016), (29.0, 0.017),  
(30.0, 0.018)

ROR\_av\_Est\_ed\_level\_Est\_mig\_rate = GRAPH(Average\_Estonia\_Education\_Level)  
(0.00, -0.12), (1.00, -0.11), (2.00, -0.1), (3.00, -0.09), (4.00, -0.08), (5.00, -0.07),  
(6.00, -0.06), (7.00, -0.05), (8.00, -0.04), (9.00, -0.03), (10.0, -0.02), (11.0, -0.01),  
(12.0, 0.00), (13.0, 0.01), (14.0, 0.02), (15.0, 0.03), (16.0, 0.04), (17.0, 0.05), (18.0, 0.06),  
(19.0, 0.07), (20.0, 0.08), (21.0, 0.09), (22.0, 0.1), (23.0, 0.11), (24.0, 0.12), (25.0, 0.13),  
(26.0, 0.14), (27.0, 0.15), (28.0, 0.16), (29.0, 0.17), (30.0, 0.18)

ROR\_av\_Hung\_ed\_level\_Hung\_GDP\_ch =  
GRAPH(Average\_Hungary\_Education\_Level)  
(0.00, -0.012), (1.00, -0.011), (2.00, -0.01), (3.00, -0.009), (4.00, -0.008), (5.00, -0.007),  
(6.00, -0.006), (7.00, -0.005), (8.00, -0.004), (9.00, -0.003), (10.0, -0.002), (11.0, -0.001),  
(12.0, 0.00), (13.0, 0.001), (14.0, 0.002), (15.0, 0.003), (16.0, 0.004), (17.0, 0.005),  
(18.0, 0.006), (19.0, 0.007), (20.0, 0.008), (21.0, 0.009), (22.0, 0.01), (23.0, 0.011),  
(24.0, 0.012), (25.0, 0.013), (26.0, 0.014), (27.0, 0.015), (28.0, 0.016), (29.0, 0.017),  
(30.0, 0.018)

ROR\_av\_Hung\_ed\_level\_Hung\_mig\_rate =  
GRAPH(Average\_Hungary\_Education\_Level)  
(0.00, -0.12), (1.00, -0.11), (2.00, -0.1), (3.00, -0.09), (4.00, -0.08), (5.00, -0.07),  
(6.00, -0.06), (7.00, -0.05), (8.00, -0.04), (9.00, -0.03), (10.0, -0.02), (11.0, -0.01),  
(12.0, 0.00), (13.0, 0.01), (14.0, 0.02), (15.0, 0.03), (16.0, 0.04), (17.0, 0.05), (18.0, 0.06),  
(19.0, 0.07), (20.0, 0.08), (21.0, 0.09), (22.0, 0.1), (23.0, 0.11), (24.0, 0.12), (25.0, 0.13),  
(26.0, 0.14), (27.0, 0.15), (28.0, 0.16), (29.0, 0.17), (30.0, 0.18)

ROR\_av\_Lat\_ed\_level\_Lat\_GDP\_ch = GRAPH(Average\_Latvia\_Education\_Level)  
(0.00, -0.012), (1.00, -0.011), (2.00, -0.01), (3.00, -0.009), (4.00, -0.008), (5.00, -0.007),  
(6.00, -0.006), (7.00, -0.005), (8.00, -0.004), (9.00, -0.003), (10.0, -0.002), (11.0, -0.001),  
(12.0, 0.00), (13.0, 0.001), (14.0, 0.002), (15.0, 0.003), (16.0, 0.004), (17.0, 0.005),  
(18.0, 0.006), (19.0, 0.007), (20.0, 0.008), (21.0, 0.009), (22.0, 0.01), (23.0, 0.011),  
(24.0, 0.012), (25.0, 0.013), (26.0, 0.014), (27.0, 0.015), (28.0, 0.016), (29.0, 0.017),  
(30.0, 0.018)

ROR\_av\_Lat\_ed\_level\_Lat\_mig\_rate = GRAPH(Average\_Latvia\_Education\_Level)  
(0.00, -0.12), (1.00, -0.11), (2.00, -0.1), (3.00, -0.09), (4.00, -0.08), (5.00, -0.07),  
(6.00, -0.06), (7.00, -0.05), (8.00, -0.04), (9.00, -0.03), (10.0, -0.02), (11.0, -0.01),  
(12.0, 0.00), (13.0, 0.01), (14.0, 0.02), (15.0, 0.03), (16.0, 0.04), (17.0, 0.05), (18.0, 0.06),  
(19.0, 0.07), (20.0, 0.08), (21.0, 0.09), (22.0, 0.1), (23.0, 0.11), (24.0, 0.12), (25.0, 0.13),  
(26.0, 0.14), (27.0, 0.15), (28.0, 0.16), (29.0, 0.17), (30.0, 0.18)

ROR\_av\_Lith\_ed\_level\_Lith\_GDP\_ch = GRAPH(Average\_Lithuania\_Education\_Level)  
(0.00, -0.012), (1.00, -0.011), (2.00, -0.01), (3.00, -0.009), (4.00, -0.008), (5.00, -0.007),  
(6.00, -0.006), (7.00, -0.005), (8.00, -0.004), (9.00, -0.003), (10.0, -0.002), (11.0, -0.001),  
(12.0, 0.00), (13.0, 0.001), (14.0, 0.002), (15.0, 0.003), (16.0, 0.004), (17.0, 0.005),  
(18.0, 0.006), (19.0, 0.007), (20.0, 0.008), (21.0, 0.009), (22.0, 0.01), (23.0, 0.011),  
(24.0, 0.012), (25.0, 0.013), (26.0, 0.014), (27.0, 0.015), (28.0, 0.016), (29.0, 0.017),  
(30.0, 0.018)

ROR\_av\_Lith\_ed\_level\_Lith\_mig\_rate = GRAPH(Average\_Lithuania\_Education\_Level)  
(0.00, -0.12), (1.00, -0.11), (2.00, -0.1), (3.00, -0.09), (4.00, -0.08), (5.00, -0.07),  
(6.00, -0.06), (7.00, -0.05), (8.00, -0.04), (9.00, -0.03), (10.0, -0.02), (11.0, -0.01),  
(12.0, 0.00), (13.0, 0.01), (14.0, 0.02), (15.0, 0.03), (16.0, 0.04), (17.0, 0.05), (18.0, 0.06),  
(19.0, 0.07), (20.0, 0.08), (21.0, 0.09), (22.0, 0.1), (23.0, 0.11), (24.0, 0.12), (25.0, 0.13),  
(26.0, 0.14), (27.0, 0.15), (28.0, 0.16), (29.0, 0.17), (30.0, 0.18)

ROR\_av\_Pol\_ed\_level\_Pol\_GDP\_ch = GRAPH(Average\_Poland\_Education\_Level)  
(0.00, -0.012), (1.00, -0.011), (2.00, -0.01), (3.00, -0.009), (4.00, -0.008), (5.00, -0.007),  
(6.00, -0.006), (7.00, -0.005), (8.00, -0.004), (9.00, -0.003), (10.0, -0.002), (11.0, -0.001),  
(12.0, 0.00), (13.0, 0.001), (14.0, 0.002), (15.0, 0.003), (16.0, 0.004), (17.0, 0.005),  
(18.0, 0.006), (19.0, 0.007), (20.0, 0.008), (21.0, 0.009), (22.0, 0.01), (23.0, 0.011),  
(24.0, 0.012), (25.0, 0.013), (26.0, 0.014), (27.0, 0.015), (28.0, 0.016), (29.0, 0.017),  
(30.0, 0.018)

ROR\_av\_Pol\_ed\_level\_Pol\_mig\_rate = GRAPH(Average\_Poland\_Education\_Level)  
(0.00, -0.12), (1.00, -0.11), (2.00, -0.1), (3.00, -0.09), (4.00, -0.08), (5.00, -0.07),  
(6.00, -0.06), (7.00, -0.05), (8.00, -0.04), (9.00, -0.03), (10.0, -0.02), (11.0, -0.01),  
(12.0, 0.00), (13.0, 0.01), (14.0, 0.02), (15.0, 0.03), (16.0, 0.04), (17.0, 0.05), (18.0, 0.06),  
(19.0, 0.07), (20.0, 0.08), (21.0, 0.09), (22.0, 0.1), (23.0, 0.11), (24.0, 0.12), (25.0, 0.13),  
(26.0, 0.14), (27.0, 0.15), (28.0, 0.16), (29.0, 0.17), (30.0, 0.18)

ROR\_av\_Rom\_ed\_level\_Rom\_GDP\_ch =  
GRAPH(Average\_Romania\_Education\_Level)  
(0.00, -0.012), (1.00, -0.011), (2.00, -0.01), (3.00, -0.009), (4.00, -0.008), (5.00, -0.007),  
(6.00, -0.006), (7.00, -0.005), (8.00, -0.004), (9.00, -0.003), (10.0, -0.002), (11.0, -0.001),  
(12.0, 0.00), (13.0, 0.001), (14.0, 0.002), (15.0, 0.003), (16.0, 0.004), (17.0, 0.005),  
(18.0, 0.006), (19.0, 0.007), (20.0, 0.008), (21.0, 0.009), (22.0, 0.01), (23.0, 0.011),  
(24.0, 0.012), (25.0, 0.013), (26.0, 0.014), (27.0, 0.015), (28.0, 0.016), (29.0, 0.017),  
(30.0, 0.018)

ROR\_av\_Rom\_ed\_level\_\_Rom\_mig\_rate =  
GRAPH(Average\_Romania\_Education\_Level)  
(0.00, -0.12), (1.00, -0.11), (2.00, -0.1), (3.00, -0.09), (4.00, -0.08), (5.00, -0.07),  
(6.00, -0.06), (7.00, -0.05), (8.00, -0.04), (9.00, -0.03), (10.0, -0.02), (11.0, -0.01),  
(12.0, 0.00), (13.0, 0.01), (14.0, 0.02), (15.0, 0.03), (16.0, 0.04), (17.0, 0.05), (18.0, 0.06),  
(19.0, 0.07), (20.0, 0.08), (21.0, 0.09), (22.0, 0.1), (23.0, 0.11), (24.0, 0.12), (25.0, 0.13),  
(26.0, 0.14), (27.0, 0.15), (28.0, 0.16), (29.0, 0.17), (30.0, 0.18)

ROR\_av\_Slv\_ed\_level\_Slv\_GDP\_ch = GRAPH(Average\_Slovenia\_Education\_Level)  
(0.00, -0.012), (1.00, -0.011), (2.00, -0.01), (3.00, -0.009), (4.00, -0.008), (5.00, -0.007),  
(6.00, -0.006), (7.00, -0.005), (8.00, -0.004), (9.00, -0.003), (10.0, -0.002), (11.0, -0.001),  
(12.0, 0.00), (13.0, 0.001), (14.0, 0.002), (15.0, 0.003), (16.0, 0.004), (17.0, 0.005),  
(18.0, 0.006), (19.0, 0.007), (20.0, 0.008), (21.0, 0.009), (22.0, 0.01), (23.0, 0.011),  
(24.0, 0.012), (25.0, 0.013), (26.0, 0.014), (27.0, 0.015), (28.0, 0.016), (29.0, 0.017),  
(30.0, 0.018)

ROR\_av\_Slv\_ed\_level\_\_Slv\_mig\_rate = GRAPH(Average\_Slovenia\_Education\_Level)  
(0.00, -0.12), (1.00, -0.11), (2.00, -0.1), (3.00, -0.09), (4.00, -0.08), (5.00, -0.07),  
(6.00, -0.06), (7.00, -0.05), (8.00, -0.04), (9.00, -0.03), (10.0, -0.02), (11.0, -0.01),  
(12.0, 0.00), (13.0, 0.01), (14.0, 0.02), (15.0, 0.03), (16.0, 0.04), (17.0, 0.05), (18.0, 0.06),  
(19.0, 0.07), (20.0, 0.08), (21.0, 0.09), (22.0, 0.1), (23.0, 0.11), (24.0, 0.12), (25.0, 0.13),  
(26.0, 0.14), (27.0, 0.15), (28.0, 0.16), (29.0, 0.17), (30.0, 0.18)

ROR\_av\_Svk\_ed\_level\_Svk\_GDP\_ch = GRAPH(Average\_Slovakia\_Education\_Level)  
(0.00, -0.012), (1.00, -0.011), (2.00, -0.01), (3.00, -0.009), (4.00, -0.008), (5.00, -0.007),  
(6.00, -0.006), (7.00, -0.005), (8.00, -0.004), (9.00, -0.003), (10.0, -0.002), (11.0, -0.001),  
(12.0, 0.00), (13.0, 0.001), (14.0, 0.002), (15.0, 0.003), (16.0, 0.004), (17.0, 0.005),  
(18.0, 0.006), (19.0, 0.007), (20.0, 0.008), (21.0, 0.009), (22.0, 0.01), (23.0, 0.011),  
(24.0, 0.012), (25.0, 0.013), (26.0, 0.014), (27.0, 0.015), (28.0, 0.016), (29.0, 0.017),  
(30.0, 0.018)

ROR\_av\_Svk\_ed\_level\_\_Svk\_mig\_rate = GRAPH(Average\_Slovakia\_Education\_Level)  
(0.00, -0.12), (1.00, -0.11), (2.00, -0.1), (3.00, -0.09), (4.00, -0.08), (5.00, -0.07),  
(6.00, -0.06), (7.00, -0.05), (8.00, -0.04), (9.00, -0.03), (10.0, -0.02), (11.0, -0.01),  
(12.0, 0.00), (13.0, 0.01), (14.0, 0.02), (15.0, 0.03), (16.0, 0.04), (17.0, 0.05), (18.0, 0.06),  
(19.0, 0.07), (20.0, 0.08), (21.0, 0.09), (22.0, 0.1), (23.0, 0.11), (24.0, 0.12), (25.0, 0.13),  
(26.0, 0.14), (27.0, 0.15), (28.0, 0.16), (29.0, 0.17), (30.0, 0.18)

ROR\_Bulg\_20\_to\_34\_pop\_Bulg\_mig\_rate =  
GRAPH(Percent\_Bulgaria\_20\_to\_34\_Population)  
(0.00, -0.2), (0.1, -0.1), (0.2, 0.00), (0.3, 0.1), (0.4, 0.2), (0.5, 0.3), (0.6, 0.4), (0.7, 0.5),  
(0.8, 0.6), (0.9, 0.7), (1, 0.8)

ROR\_Bulg\_GDP\_ch\_Bulg\_ed\_level\_ch = GRAPH(ch\_Bulg\_GDP)  
(0.7, -0.03), (0.71, -0.029), (0.72, -0.028), (0.73, -0.027), (0.74, -0.026), (0.75, -0.025),  
(0.76, -0.024), (0.77, -0.023), (0.78, -0.022), (0.79, -0.021), (0.8, -0.02), (0.81, -0.019),  
(0.82, -0.018), (0.83, -0.017), (0.84, -0.016), (0.85, -0.015), (0.86, -0.014), (0.87, -0.013),  
(0.88, -0.012), (0.89, -0.011), (0.9, -0.01), (0.91, -0.009), (0.92, -0.008), (0.93, -0.007),  
(0.94, -0.006), (0.95, -0.005), (0.96, -0.004), (0.97, -0.003), (0.98, -0.002), (0.99, -0.001),  
(1.00, 0.00), (1.01, 0.001), (1.02, 0.002), (1.03, 0.003), (1.04, 0.004), (1.05, 0.005),  
(1.06, 0.006), (1.07, 0.007), (1.08, 0.008), (1.09, 0.009), (1.10, 0.01), (1.11, 0.011),  
(1.12, 0.012), (1.13, 0.013), (1.14, 0.014), (1.15, 0.015), (1.16, 0.016), (1.17, 0.017),  
(1.18, 0.018), (1.19, 0.019), (1.20, 0.02), (1.21, 0.021), (1.22, 0.022), (1.23, 0.023),  
(1.24, 0.024), (1.25, 0.025), (1.26, 0.026), (1.27, 0.027), (1.28, 0.028), (1.29, 0.029),  
(1.30, 0.03)

ROR\_Bulg\_GDP\_ch\_Bulg\_employ\_ch = GRAPH(ch\_Bulg\_GDP)  
(0.7, -0.3), (0.71, -0.29), (0.72, -0.28), (0.73, -0.27), (0.74, -0.26), (0.75, -0.25),  
(0.76, -0.24), (0.77, -0.23), (0.78, -0.22), (0.79, -0.21), (0.8, -0.2), (0.81, -0.19),  
(0.82, -0.18), (0.83, -0.17), (0.84, -0.16), (0.85, -0.15), (0.86, -0.14), (0.87, -0.13),  
(0.88, -0.12), (0.89, -0.11), (0.9, -0.1), (0.91, -0.09), (0.92, -0.08), (0.93, -0.07),  
(0.94, -0.06), (0.95, -0.05), (0.96, -0.04), (0.97, -0.03), (0.98, -0.02), (0.99, -0.01),  
(1.00, 0.00), (1.01, 0.01), (1.02, 0.02), (1.03, 0.03), (1.04, 0.04), (1.05, 0.05), (1.06, 0.06),  
(1.07, 0.07), (1.08, 0.08), (1.09, 0.09), (1.10, 0.1), (1.11, 0.11), (1.12, 0.12), (1.13, 0.13),  
(1.14, 0.14), (1.15, 0.15), (1.16, 0.16), (1.17, 0.17), (1.18, 0.18), (1.19, 0.19), (1.20, 0.2),  
(1.21, 0.21), (1.22, 0.22), (1.23, 0.23), (1.24, 0.24), (1.25, 0.25), (1.26, 0.26), (1.27, 0.27),  
(1.28, 0.28), (1.29, 0.29), (1.30, 0.3)

ROR\_Bulg\_GDP\_ch\_pct\_Bulg\_coll\_migrants\_ch = GRAPH(ch\_Bulg\_GDP)  
(0.7, 0.15), (0.71, 0.145), (0.72, 0.14), (0.73, 0.135), (0.74, 0.13), (0.75, 0.125),  
(0.76, 0.12), (0.77, 0.115), (0.78, 0.11), (0.79, 0.105), (0.8, 0.1), (0.81, 0.095),  
(0.82, 0.09), (0.83, 0.085), (0.84, 0.08), (0.85, 0.075), (0.86, 0.07), (0.87, 0.065),  
(0.88, 0.06), (0.89, 0.055), (0.9, 0.05), (0.91, 0.045), (0.92, 0.04), (0.93, 0.035),  
(0.94, 0.03), (0.95, 0.025), (0.96, 0.02), (0.97, 0.015), (0.98, 0.01), (0.99, 0.005),  
(1.00, 0.00), (1.01, -0.005), (1.02, -0.01), (1.03, -0.015), (1.04, -0.02), (1.05, -0.025),  
(1.06, -0.03), (1.07, -0.035), (1.08, -0.04), (1.09, -0.045), (1.10, -0.05), (1.11, -0.055),  
(1.12, -0.06), (1.13, -0.065), (1.14, -0.07), (1.15, -0.075), (1.16, -0.08), (1.17, -0.085),  
(1.18, -0.09), (1.19, -0.095), (1.20, -0.1), (1.21, -0.105), (1.22, -0.11), (1.23, -0.115),  
(1.24, -0.12), (1.25, -0.125), (1.26, -0.13), (1.27, -0.135), (1.28, -0.14), (1.29, -0.145),  
(1.30, -0.15)

ROR\_Bulg\_mig\_stk\_Bulg\_employ\_ch = GRAPH(per\_capita\_Bulg\_mig\_stk)  
(0.00, 0.00), (0.05, 0.05), (0.1, 0.1), (0.15, 0.15), (0.2, 0.2), (0.25, 0.25), (0.3, 0.3),  
(0.35, 0.35), (0.4, 0.4), (0.45, 0.45), (0.5, 0.5), (0.55, 0.55), (0.6, 0.6), (0.65, 0.65),  
(0.7, 0.7), (0.75, 0.75), (0.8, 0.8), (0.85, 0.85), (0.9, 0.9), (0.95, 0.95), (1.00, 1.00)

ROR\_Czech\_20\_to\_34\_pop\_Czech\_mig\_rate =  
GRAPH(Percent\_Czech\_20\_to\_34\_Population)  
(0.00, -0.2), (0.1, -0.1), (0.2, 0.00), (0.3, 0.1), (0.4, 0.2), (0.5, 0.3), (0.6, 0.4), (0.7, 0.5),  
(0.8, 0.6), (0.9, 0.7), (1, 0.8)

ROR\_Czech\_GDP\_ch\_Czech\_ed\_level\_ch = GRAPH(ch\_Czech\_GDP)  
(0.7, -0.03), (0.71, -0.029), (0.72, -0.028), (0.73, -0.027), (0.74, -0.026), (0.75, -0.025),  
(0.76, -0.024), (0.77, -0.023), (0.78, -0.022), (0.79, -0.021), (0.8, -0.02), (0.81, -0.019),  
(0.82, -0.018), (0.83, -0.017), (0.84, -0.016), (0.85, -0.015), (0.86, -0.014), (0.87, -0.013),  
(0.88, -0.012), (0.89, -0.011), (0.9, -0.01), (0.91, -0.009), (0.92, -0.008), (0.93, -0.007),  
(0.94, -0.006), (0.95, -0.005), (0.96, -0.004), (0.97, -0.003), (0.98, -0.002), (0.99, -0.001),  
(1.00, 0.00), (1.01, 0.001), (1.02, 0.002), (1.03, 0.003), (1.04, 0.004), (1.05, 0.005),  
(1.06, 0.006), (1.07, 0.007), (1.08, 0.008), (1.09, 0.009), (1.10, 0.01), (1.11, 0.011),  
(1.12, 0.012), (1.13, 0.013), (1.14, 0.014), (1.15, 0.015), (1.16, 0.016), (1.17, 0.017),  
(1.18, 0.018), (1.19, 0.019), (1.20, 0.02), (1.21, 0.021), (1.22, 0.022), (1.23, 0.023),  
(1.24, 0.024), (1.25, 0.025), (1.26, 0.026), (1.27, 0.027), (1.28, 0.028), (1.29, 0.029),  
(1.30, 0.03)

ROR\_Czech\_GDP\_ch\_Czech\_employ\_ch = GRAPH(ch\_Czech\_GDP)  
(0.7, -0.3), (0.71, -0.29), (0.72, -0.28), (0.73, -0.27), (0.74, -0.26), (0.75, -0.25),  
(0.76, -0.24), (0.77, -0.23), (0.78, -0.22), (0.79, -0.21), (0.8, -0.2), (0.81, -0.19),  
(0.82, -0.18), (0.83, -0.17), (0.84, -0.16), (0.85, -0.15), (0.86, -0.14), (0.87, -0.13),  
(0.88, -0.12), (0.89, -0.11), (0.9, -0.1), (0.91, -0.09), (0.92, -0.08), (0.93, -0.07),  
(0.94, -0.06), (0.95, -0.05), (0.96, -0.04), (0.97, -0.03), (0.98, -0.02), (0.99, -0.01),  
(1.00, 0.00), (1.01, 0.01), (1.02, 0.02), (1.03, 0.03), (1.04, 0.04), (1.05, 0.05), (1.06, 0.06),  
(1.07, 0.07), (1.08, 0.08), (1.09, 0.09), (1.10, 0.1), (1.11, 0.11), (1.12, 0.12), (1.13, 0.13),  
(1.14, 0.14), (1.15, 0.15), (1.16, 0.16), (1.17, 0.17), (1.18, 0.18), (1.19, 0.19), (1.20, 0.2),  
(1.21, 0.21), (1.22, 0.22), (1.23, 0.23), (1.24, 0.24), (1.25, 0.25), (1.26, 0.26), (1.27, 0.27),  
(1.28, 0.28), (1.29, 0.29), (1.30, 0.3)

ROR\_Czech\_GDP\_ch\_pct\_Czech\_coll\_migrants\_ch = GRAPH(ch\_Czech\_GDP)  
(0.7, 0.15), (0.71, 0.145), (0.72, 0.14), (0.73, 0.135), (0.74, 0.13), (0.75, 0.125),  
(0.76, 0.12), (0.77, 0.115), (0.78, 0.11), (0.79, 0.105), (0.8, 0.1), (0.81, 0.095),  
(0.82, 0.09), (0.83, 0.085), (0.84, 0.08), (0.85, 0.075), (0.86, 0.07), (0.87, 0.065),  
(0.88, 0.06), (0.89, 0.055), (0.9, 0.05), (0.91, 0.045), (0.92, 0.04), (0.93, 0.035),  
(0.94, 0.03), (0.95, 0.025), (0.96, 0.02), (0.97, 0.015), (0.98, 0.01), (0.99, 0.005),  
(1.00, 0.00), (1.01, -0.005), (1.02, -0.01), (1.03, -0.015), (1.04, -0.02), (1.05, -0.025),  
(1.06, -0.03), (1.07, -0.035), (1.08, -0.04), (1.09, -0.045), (1.10, -0.05), (1.11, -0.055),  
(1.12, -0.06), (1.13, -0.065), (1.14, -0.07), (1.15, -0.075), (1.16, -0.08), (1.17, -0.085),  
(1.18, -0.09), (1.19, -0.095), (1.20, -0.1), (1.21, -0.105), (1.22, -0.11), (1.23, -0.115),  
(1.24, -0.12), (1.25, -0.125), (1.26, -0.13), (1.27, -0.135), (1.28, -0.14), (1.29, -0.145),  
(1.30, -0.15)

ROR\_Czech\_migstk\_Czech\_employ\_ch = GRAPH(per\_capita\_Czech\_mig\_stk)  
(0.00, 0.00), (0.05, 0.05), (0.1, 0.1), (0.15, 0.15), (0.2, 0.2), (0.25, 0.25), (0.3, 0.3),  
(0.35, 0.35), (0.4, 0.4), (0.45, 0.45), (0.5, 0.5), (0.55, 0.55), (0.6, 0.6), (0.65, 0.65),  
(0.7, 0.7), (0.75, 0.75), (0.8, 0.8), (0.85, 0.85), (0.9, 0.9), (0.95, 0.95), (1.00, 1.00)

ROR\_Est\_20\_to\_34\_pop\_Est\_mig\_rate =  
GRAPH(Percent\_Estonia\_20\_to\_34\_Population)  
(0.00, -0.2), (0.1, -0.1), (0.2, 0.00), (0.3, 0.1), (0.4, 0.2), (0.5, 0.3), (0.6, 0.4), (0.7, 0.5),  
(0.8, 0.6), (0.9, 0.7), (1, 0.8)

ROR\_Est\_GDP\_ch\_Est\_ed\_level\_ch = GRAPH(ch\_Est\_GDP)  
(0.7, -0.03), (0.71, -0.029), (0.72, -0.028), (0.73, -0.027), (0.74, -0.026), (0.75, -0.025),  
(0.76, -0.024), (0.77, -0.023), (0.78, -0.022), (0.79, -0.021), (0.8, -0.02), (0.81, -0.019),  
(0.82, -0.018), (0.83, -0.017), (0.84, -0.016), (0.85, -0.015), (0.86, -0.014), (0.87, -0.013),  
(0.88, -0.012), (0.89, -0.011), (0.9, -0.01), (0.91, -0.009), (0.92, -0.008), (0.93, -0.007),  
(0.94, -0.006), (0.95, -0.005), (0.96, -0.004), (0.97, -0.003), (0.98, -0.002), (0.99, -0.001),  
(1.00, 0.00), (1.01, 0.001), (1.02, 0.002), (1.03, 0.003), (1.04, 0.004), (1.05, 0.005),  
(1.06, 0.006), (1.07, 0.007), (1.08, 0.008), (1.09, 0.009), (1.10, 0.01), (1.11, 0.011),  
(1.12, 0.012), (1.13, 0.013), (1.14, 0.014), (1.15, 0.015), (1.16, 0.016), (1.17, 0.017),  
(1.18, 0.018), (1.19, 0.019), (1.20, 0.02), (1.21, 0.021), (1.22, 0.022), (1.23, 0.023),  
(1.24, 0.024), (1.25, 0.025), (1.26, 0.026), (1.27, 0.027), (1.28, 0.028), (1.29, 0.029),  
(1.30, 0.03)

ROR\_Est\_GDP\_ch\_Est\_employ\_ch = GRAPH(ch\_Est\_GDP)

(0.7, -0.3), (0.71, -0.29), (0.72, -0.28), (0.73, -0.27), (0.74, -0.26), (0.75, -0.25),  
(0.76, -0.24), (0.77, -0.23), (0.78, -0.22), (0.79, -0.21), (0.8, -0.2), (0.81, -0.19),  
(0.82, -0.18), (0.83, -0.17), (0.84, -0.16), (0.85, -0.15), (0.86, -0.14), (0.87, -0.13),  
(0.88, -0.12), (0.89, -0.11), (0.9, -0.1), (0.91, -0.09), (0.92, -0.08), (0.93, -0.07),  
(0.94, -0.06), (0.95, -0.05), (0.96, -0.04), (0.97, -0.03), (0.98, -0.02), (0.99, -0.01),  
(1.00, 0.00), (1.01, 0.01), (1.02, 0.02), (1.03, 0.03), (1.04, 0.04), (1.05, 0.05), (1.06, 0.06),  
(1.07, 0.07), (1.08, 0.08), (1.09, 0.09), (1.10, 0.1), (1.11, 0.11), (1.12, 0.12), (1.13, 0.13),  
(1.14, 0.14), (1.15, 0.15), (1.16, 0.16), (1.17, 0.17), (1.18, 0.18), (1.19, 0.19), (1.20, 0.2),  
(1.21, 0.21), (1.22, 0.22), (1.23, 0.23), (1.24, 0.24), (1.25, 0.25), (1.26, 0.26), (1.27, 0.27),  
(1.28, 0.28), (1.29, 0.29), (1.30, 0.3)

ROR\_Est\_GDP\_ch\_pct\_Est\_coll\_migrants\_ch = GRAPH(ch\_Est\_GDP)

(0.7, 0.15), (0.71, 0.145), (0.72, 0.14), (0.73, 0.135), (0.74, 0.13), (0.75, 0.125),  
(0.76, 0.12), (0.77, 0.115), (0.78, 0.11), (0.79, 0.105), (0.8, 0.1), (0.81, 0.095),  
(0.82, 0.09), (0.83, 0.085), (0.84, 0.08), (0.85, 0.075), (0.86, 0.07), (0.87, 0.065),  
(0.88, 0.06), (0.89, 0.055), (0.9, 0.05), (0.91, 0.045), (0.92, 0.04), (0.93, 0.035),  
(0.94, 0.03), (0.95, 0.025), (0.96, 0.02), (0.97, 0.015), (0.98, 0.01), (0.99, 0.005),  
(1.00, 0.00), (1.01, -0.005), (1.02, -0.01), (1.03, -0.015), (1.04, -0.02), (1.05, -0.025),  
(1.06, -0.03), (1.07, -0.035), (1.08, -0.04), (1.09, -0.045), (1.10, -0.05), (1.11, -0.055),  
(1.12, -0.06), (1.13, -0.065), (1.14, -0.07), (1.15, -0.075), (1.16, -0.08), (1.17, -0.085),  
(1.18, -0.09), (1.19, -0.095), (1.20, -0.1), (1.21, -0.105), (1.22, -0.11), (1.23, -0.115),  
(1.24, -0.12), (1.25, -0.125), (1.26, -0.13), (1.27, -0.135), (1.28, -0.14), (1.29, -0.145),  
(1.30, -0.15)

ROR\_Est\_migstk\_Est\_employ\_ch = GRAPH(per\_capita\_Est\_mig\_stk)

(0.00, 0.00), (0.05, 0.05), (0.1, 0.1), (0.15, 0.15), (0.2, 0.2), (0.25, 0.25), (0.3, 0.3),  
(0.35, 0.35), (0.4, 0.4), (0.45, 0.45), (0.5, 0.5), (0.55, 0.55), (0.6, 0.6), (0.65, 0.65),  
(0.7, 0.7), (0.75, 0.75), (0.8, 0.8), (0.85, 0.85), (0.9, 0.9), (0.95, 0.95), (1.00, 1.00)

ROR\_German\_GDP\_ch\_German\_employ\_ch = GRAPH(ch\_German\_GDP)

(0.7, -0.3), (0.71, -0.29), (0.72, -0.28), (0.73, -0.27), (0.74, -0.26), (0.75, -0.25),  
(0.76, -0.24), (0.77, -0.23), (0.78, -0.22), (0.79, -0.21), (0.8, -0.2), (0.81, -0.19),  
(0.82, -0.18), (0.83, -0.17), (0.84, -0.16), (0.85, -0.15), (0.86, -0.14), (0.87, -0.13),  
(0.88, -0.12), (0.89, -0.11), (0.9, -0.1), (0.91, -0.09), (0.92, -0.08), (0.93, -0.07),  
(0.94, -0.06), (0.95, -0.05), (0.96, -0.04), (0.97, -0.03), (0.98, -0.02), (0.99, -0.01),  
(1.00, 0.00), (1.01, 0.01), (1.02, 0.02), (1.03, 0.03), (1.04, 0.04), (1.05, 0.05), (1.06, 0.06),  
(1.07, 0.07), (1.08, 0.08), (1.09, 0.09), (1.10, 0.1), (1.11, 0.11), (1.12, 0.12), (1.13, 0.13),  
(1.14, 0.14), (1.15, 0.15), (1.16, 0.16), (1.17, 0.17), (1.18, 0.18), (1.19, 0.19), (1.20, 0.2),  
(1.21, 0.21), (1.22, 0.22), (1.23, 0.23), (1.24, 0.24), (1.25, 0.25), (1.26, 0.26), (1.27, 0.27),  
(1.28, 0.28), (1.29, 0.29), (1.30, 0.3)

ROR\_German\_GDP\_ch\_pct\_coll\_migrants\_ch = GRAPH(ch\_German\_GDP)  
(0.7, -0.15), (0.71, -0.145), (0.72, -0.14), (0.73, -0.135), (0.74, -0.13), (0.75, -0.125),  
(0.76, -0.12), (0.77, -0.115), (0.78, -0.11), (0.79, -0.105), (0.8, -0.1), (0.81, -0.095),  
(0.82, -0.09), (0.83, -0.085), (0.84, -0.08), (0.85, -0.075), (0.86, -0.07), (0.87, -0.065),  
(0.88, -0.06), (0.89, -0.055), (0.9, -0.05), (0.91, -0.045), (0.92, -0.04), (0.93, -0.035),  
(0.94, -0.03), (0.95, -0.025), (0.96, -0.02), (0.97, -0.015), (0.98, -0.01), (0.99, -0.005),  
(1.00, 0.00), (1.01, 0.005), (1.02, 0.01), (1.03, 0.015), (1.04, 0.02), (1.05, 0.025),  
(1.06, 0.03), (1.07, 0.035), (1.08, 0.04), (1.09, 0.045), (1.10, 0.05), (1.11, 0.055),  
(1.12, 0.06), (1.13, 0.065), (1.14, 0.07), (1.15, 0.075), (1.16, 0.08), (1.17, 0.085),  
(1.18, 0.09), (1.19, 0.095), (1.20, 0.1), (1.21, 0.105), (1.22, 0.11), (1.23, 0.115),  
(1.24, 0.12), (1.25, 0.125), (1.26, 0.13), (1.27, 0.135), (1.28, 0.14), (1.29, 0.145),  
(1.30, 0.15)

ROR\_Hung\_20\_to\_34\_pop\_Hung\_mig\_rate =  
GRAPH(Percent\_Hungary\_20\_to\_34\_Population)  
(0.00, -0.2), (0.1, -0.1), (0.2, 0.00), (0.3, 0.1), (0.4, 0.2), (0.5, 0.3), (0.6, 0.4), (0.7, 0.5),  
(0.8, 0.6), (0.9, 0.7), (1, 0.8)

ROR\_Hung\_GDP\_ch\_Hung\_ed\_level\_ch = GRAPH(ch\_Hung\_GDP)  
(0.7, -0.03), (0.71, -0.029), (0.72, -0.028), (0.73, -0.027), (0.74, -0.026), (0.75, -0.025),  
(0.76, -0.024), (0.77, -0.023), (0.78, -0.022), (0.79, -0.021), (0.8, -0.02), (0.81, -0.019),  
(0.82, -0.018), (0.83, -0.017), (0.84, -0.016), (0.85, -0.015), (0.86, -0.014), (0.87, -0.013),  
(0.88, -0.012), (0.89, -0.011), (0.9, -0.01), (0.91, -0.009), (0.92, -0.008), (0.93, -0.007),  
(0.94, -0.006), (0.95, -0.005), (0.96, -0.004), (0.97, -0.003), (0.98, -0.002), (0.99, -0.001),  
(1.00, 0.00), (1.01, 0.001), (1.02, 0.002), (1.03, 0.003), (1.04, 0.004), (1.05, 0.005),  
(1.06, 0.006), (1.07, 0.007), (1.08, 0.008), (1.09, 0.009), (1.10, 0.01), (1.11, 0.011),  
(1.12, 0.012), (1.13, 0.013), (1.14, 0.014), (1.15, 0.015), (1.16, 0.016), (1.17, 0.017),  
(1.18, 0.018), (1.19, 0.019), (1.20, 0.02), (1.21, 0.021), (1.22, 0.022), (1.23, 0.023),  
(1.24, 0.024), (1.25, 0.025), (1.26, 0.026), (1.27, 0.027), (1.28, 0.028), (1.29, 0.029),  
(1.30, 0.03)

ROR\_Hung\_GDP\_ch\_Hung\_employ\_ch = GRAPH(ch\_Hung\_GDP)  
(0.7, -0.3), (0.71, -0.29), (0.72, -0.28), (0.73, -0.27), (0.74, -0.26), (0.75, -0.25),  
(0.76, -0.24), (0.77, -0.23), (0.78, -0.22), (0.79, -0.21), (0.8, -0.2), (0.81, -0.19),  
(0.82, -0.18), (0.83, -0.17), (0.84, -0.16), (0.85, -0.15), (0.86, -0.14), (0.87, -0.13),  
(0.88, -0.12), (0.89, -0.11), (0.9, -0.1), (0.91, -0.09), (0.92, -0.08), (0.93, -0.07),  
(0.94, -0.06), (0.95, -0.05), (0.96, -0.04), (0.97, -0.03), (0.98, -0.02), (0.99, -0.01),  
(1.00, 0.00), (1.01, 0.01), (1.02, 0.02), (1.03, 0.03), (1.04, 0.04), (1.05, 0.05), (1.06, 0.06),  
(1.07, 0.07), (1.08, 0.08), (1.09, 0.09), (1.10, 0.1), (1.11, 0.11), (1.12, 0.12), (1.13, 0.13),  
(1.14, 0.14), (1.15, 0.15), (1.16, 0.16), (1.17, 0.17), (1.18, 0.18), (1.19, 0.19), (1.20, 0.2),  
(1.21, 0.21), (1.22, 0.22), (1.23, 0.23), (1.24, 0.24), (1.25, 0.25), (1.26, 0.26), (1.27, 0.27),  
(1.28, 0.28), (1.29, 0.29), (1.30, 0.3)

ROR\_Hung\_GDP\_ch\_pct\_Hung\_coll\_migrants\_ch = GRAPH(ch\_Hung\_GDP)  
(0.7, 0.15), (0.71, 0.145), (0.72, 0.14), (0.73, 0.135), (0.74, 0.13), (0.75, 0.125),  
(0.76, 0.12), (0.77, 0.115), (0.78, 0.11), (0.79, 0.105), (0.8, 0.1), (0.81, 0.095),  
(0.82, 0.09), (0.83, 0.085), (0.84, 0.08), (0.85, 0.075), (0.86, 0.07), (0.87, 0.065),  
(0.88, 0.06), (0.89, 0.055), (0.9, 0.05), (0.91, 0.045), (0.92, 0.04), (0.93, 0.035),  
(0.94, 0.03), (0.95, 0.025), (0.96, 0.02), (0.97, 0.015), (0.98, 0.01), (0.99, 0.005),  
(1.00, 0.00), (1.01, -0.005), (1.02, -0.01), (1.03, -0.015), (1.04, -0.02), (1.05, -0.025),  
(1.06, -0.03), (1.07, -0.035), (1.08, -0.04), (1.09, -0.045), (1.10, -0.05), (1.11, -0.055),  
(1.12, -0.06), (1.13, -0.065), (1.14, -0.07), (1.15, -0.075), (1.16, -0.08), (1.17, -0.085),  
(1.18, -0.09), (1.19, -0.095), (1.20, -0.1), (1.21, -0.105), (1.22, -0.11), (1.23, -0.115),  
(1.24, -0.12), (1.25, -0.125), (1.26, -0.13), (1.27, -0.135), (1.28, -0.14), (1.29, -0.145),  
(1.30, -0.15)

ROR\_Hung\_migstk\_Hung\_employ\_ch = GRAPH(per\_capita\_Hung\_mig\_stk)  
(0.00, 0.00), (0.05, 0.05), (0.1, 0.1), (0.15, 0.15), (0.2, 0.2), (0.25, 0.25), (0.3, 0.3),  
(0.35, 0.35), (0.4, 0.4), (0.45, 0.45), (0.5, 0.5), (0.55, 0.55), (0.6, 0.6), (0.65, 0.65),  
(0.7, 0.7), (0.75, 0.75), (0.8, 0.8), (0.85, 0.85), (0.9, 0.9), (0.95, 0.95), (1.00, 1.00)

ROR\_Lat\_20\_to\_34\_pop\_Lat\_mig\_rate =  
GRAPH(Percent\_Latvia\_20\_to\_34\_Population)  
(0.00, -0.2), (0.1, -0.1), (0.2, 0.00), (0.3, 0.1), (0.4, 0.2), (0.5, 0.3), (0.6, 0.4), (0.7, 0.5),  
(0.8, 0.6), (0.9, 0.7), (1, 0.8)

ROR\_Lat\_GDP\_ch\_Lat\_ed\_level\_ch = GRAPH(ch\_Lat\_GDP)  
(0.7, -0.03), (0.71, -0.029), (0.72, -0.028), (0.73, -0.027), (0.74, -0.026), (0.75, -0.025),  
(0.76, -0.024), (0.77, -0.023), (0.78, -0.022), (0.79, -0.021), (0.8, -0.02), (0.81, -0.019),  
(0.82, -0.018), (0.83, -0.017), (0.84, -0.016), (0.85, -0.015), (0.86, -0.014), (0.87, -0.013),  
(0.88, -0.012), (0.89, -0.011), (0.9, -0.01), (0.91, -0.009), (0.92, -0.008), (0.93, -0.007),  
(0.94, -0.006), (0.95, -0.005), (0.96, -0.004), (0.97, -0.003), (0.98, -0.002), (0.99, -0.001),  
(1.00, 0.00), (1.01, 0.001), (1.02, 0.002), (1.03, 0.003), (1.04, 0.004), (1.05, 0.005),  
(1.06, 0.006), (1.07, 0.007), (1.08, 0.008), (1.09, 0.009), (1.10, 0.01), (1.11, 0.011),  
(1.12, 0.012), (1.13, 0.013), (1.14, 0.014), (1.15, 0.015), (1.16, 0.016), (1.17, 0.017),  
(1.18, 0.018), (1.19, 0.019), (1.20, 0.02), (1.21, 0.021), (1.22, 0.022), (1.23, 0.023),  
(1.24, 0.024), (1.25, 0.025), (1.26, 0.026), (1.27, 0.027), (1.28, 0.028), (1.29, 0.029),  
(1.30, 0.03)

ROR\_Lat\_GDP\_ch\_Lat\_employ\_ch = GRAPH(ch\_Lat\_GDP)  
(0.7, -0.3), (0.71, -0.29), (0.72, -0.28), (0.73, -0.27), (0.74, -0.26), (0.75, -0.25),  
(0.76, -0.24), (0.77, -0.23), (0.78, -0.22), (0.79, -0.21), (0.8, -0.2), (0.81, -0.19),  
(0.82, -0.18), (0.83, -0.17), (0.84, -0.16), (0.85, -0.15), (0.86, -0.14), (0.87, -0.13),  
(0.88, -0.12), (0.89, -0.11), (0.9, -0.1), (0.91, -0.09), (0.92, -0.08), (0.93, -0.07),  
(0.94, -0.06), (0.95, -0.05), (0.96, -0.04), (0.97, -0.03), (0.98, -0.02), (0.99, -0.01),  
(1.00, 0.00), (1.01, 0.01), (1.02, 0.02), (1.03, 0.03), (1.04, 0.04), (1.05, 0.05), (1.06, 0.06),  
(1.07, 0.07), (1.08, 0.08), (1.09, 0.09), (1.10, 0.1), (1.11, 0.11), (1.12, 0.12), (1.13, 0.13),  
(1.14, 0.14), (1.15, 0.15), (1.16, 0.16), (1.17, 0.17), (1.18, 0.18), (1.19, 0.19), (1.20, 0.2),  
(1.21, 0.21), (1.22, 0.22), (1.23, 0.23), (1.24, 0.24), (1.25, 0.25), (1.26, 0.26), (1.27, 0.27),  
(1.28, 0.28), (1.29, 0.29), (1.30, 0.3)

ROR\_Lat\_GDP\_ch\_pct\_Lat\_coll\_migrants\_ch = GRAPH(ch\_Lat\_GDP)  
(0.7, 0.15), (0.71, 0.145), (0.72, 0.14), (0.73, 0.135), (0.74, 0.13), (0.75, 0.125),  
(0.76, 0.12), (0.77, 0.115), (0.78, 0.11), (0.79, 0.105), (0.8, 0.1), (0.81, 0.095),  
(0.82, 0.09), (0.83, 0.085), (0.84, 0.08), (0.85, 0.075), (0.86, 0.07), (0.87, 0.065),  
(0.88, 0.06), (0.89, 0.055), (0.9, 0.05), (0.91, 0.045), (0.92, 0.04), (0.93, 0.035),  
(0.94, 0.03), (0.95, 0.025), (0.96, 0.02), (0.97, 0.015), (0.98, 0.01), (0.99, 0.005),  
(1.00, 0.00), (1.01, -0.005), (1.02, -0.01), (1.03, -0.015), (1.04, -0.02), (1.05, -0.025),  
(1.06, -0.03), (1.07, -0.035), (1.08, -0.04), (1.09, -0.045), (1.10, -0.05), (1.11, -0.055),  
(1.12, -0.06), (1.13, -0.065), (1.14, -0.07), (1.15, -0.075), (1.16, -0.08), (1.17, -0.085),  
(1.18, -0.09), (1.19, -0.095), (1.20, -0.1), (1.21, -0.105), (1.22, -0.11), (1.23, -0.115),  
(1.24, -0.12), (1.25, -0.125), (1.26, -0.13), (1.27, -0.135), (1.28, -0.14), (1.29, -0.145),  
(1.30, -0.15)

ROR\_Lat\_migstk\_Lat\_employ\_ch = GRAPH(per\_capita\_Lat\_mig\_stk)  
(0.00, 0.00), (0.05, 0.05), (0.1, 0.1), (0.15, 0.15), (0.2, 0.2), (0.25, 0.25), (0.3, 0.3),  
(0.35, 0.35), (0.4, 0.4), (0.45, 0.45), (0.5, 0.5), (0.55, 0.55), (0.6, 0.6), (0.65, 0.65),  
(0.7, 0.7), (0.75, 0.75), (0.8, 0.8), (0.85, 0.85), (0.9, 0.9), (0.95, 0.95), (1.00, 1.00)

ROR\_Lith\_20\_to\_34\_pop\_Lith\_mig\_rate =  
GRAPH(Percent\_Lithuania\_20\_to\_34\_Population)  
(0.00, -0.2), (0.1, -0.1), (0.2, 0.00), (0.3, 0.1), (0.4, 0.2), (0.5, 0.3), (0.6, 0.4), (0.7, 0.5),  
(0.8, 0.6), (0.9, 0.7), (1, 0.8)

ROR\_Lith\_GDP\_ch\_Lith\_ed\_level\_ch = GRAPH(ch\_Lith\_GDP)  
(0.7, -0.03), (0.71, -0.029), (0.72, -0.028), (0.73, -0.027), (0.74, -0.026), (0.75, -0.025),  
(0.76, -0.024), (0.77, -0.023), (0.78, -0.022), (0.79, -0.021), (0.8, -0.02), (0.81, -0.019),  
(0.82, -0.018), (0.83, -0.017), (0.84, -0.016), (0.85, -0.015), (0.86, -0.014), (0.87, -0.013),  
(0.88, -0.012), (0.89, -0.011), (0.9, -0.01), (0.91, -0.009), (0.92, -0.008), (0.93, -0.007),  
(0.94, -0.006), (0.95, -0.005), (0.96, -0.004), (0.97, -0.003), (0.98, -0.002), (0.99, -0.001),  
(1.00, 0.00), (1.01, 0.001), (1.02, 0.002), (1.03, 0.003), (1.04, 0.004), (1.05, 0.005),  
(1.06, 0.006), (1.07, 0.007), (1.08, 0.008), (1.09, 0.009), (1.10, 0.01), (1.11, 0.011),  
(1.12, 0.012), (1.13, 0.013), (1.14, 0.014), (1.15, 0.015), (1.16, 0.016), (1.17, 0.017),  
(1.18, 0.018), (1.19, 0.019), (1.20, 0.02), (1.21, 0.021), (1.22, 0.022), (1.23, 0.023),  
(1.24, 0.024), (1.25, 0.025), (1.26, 0.026), (1.27, 0.027), (1.28, 0.028), (1.29, 0.029),  
(1.30, 0.03)

ROR\_Lith\_GDP\_ch\_Lith\_employ\_ch = GRAPH(ch\_Lith\_GDP)  
(0.7, -0.3), (0.71, -0.29), (0.72, -0.28), (0.73, -0.27), (0.74, -0.26), (0.75, -0.25),  
(0.76, -0.24), (0.77, -0.23), (0.78, -0.22), (0.79, -0.21), (0.8, -0.2), (0.81, -0.19),  
(0.82, -0.18), (0.83, -0.17), (0.84, -0.16), (0.85, -0.15), (0.86, -0.14), (0.87, -0.13),  
(0.88, -0.12), (0.89, -0.11), (0.9, -0.1), (0.91, -0.09), (0.92, -0.08), (0.93, -0.07),  
(0.94, -0.06), (0.95, -0.05), (0.96, -0.04), (0.97, -0.03), (0.98, -0.02), (0.99, -0.01),  
(1.00, 0.00), (1.01, 0.01), (1.02, 0.02), (1.03, 0.03), (1.04, 0.04), (1.05, 0.05), (1.06, 0.06),  
(1.07, 0.07), (1.08, 0.08), (1.09, 0.09), (1.10, 0.1), (1.11, 0.11), (1.12, 0.12), (1.13, 0.13),  
(1.14, 0.14), (1.15, 0.15), (1.16, 0.16), (1.17, 0.17), (1.18, 0.18), (1.19, 0.19), (1.20, 0.2),  
(1.21, 0.21), (1.22, 0.22), (1.23, 0.23), (1.24, 0.24), (1.25, 0.25), (1.26, 0.26), (1.27, 0.27),  
(1.28, 0.28), (1.29, 0.29), (1.30, 0.3)

ROR\_Lith\_GDP\_ch\_pct\_Lith\_coll\_migrants\_ch = GRAPH(ch\_Lith\_GDP)  
(0.7, 0.15), (0.71, 0.145), (0.72, 0.14), (0.73, 0.135), (0.74, 0.13), (0.75, 0.125),  
(0.76, 0.12), (0.77, 0.115), (0.78, 0.11), (0.79, 0.105), (0.8, 0.1), (0.81, 0.095),  
(0.82, 0.09), (0.83, 0.085), (0.84, 0.08), (0.85, 0.075), (0.86, 0.07), (0.87, 0.065),  
(0.88, 0.06), (0.89, 0.055), (0.9, 0.05), (0.91, 0.045), (0.92, 0.04), (0.93, 0.035),  
(0.94, 0.03), (0.95, 0.025), (0.96, 0.02), (0.97, 0.015), (0.98, 0.01), (0.99, 0.005),  
(1.00, 0.00), (1.01, -0.005), (1.02, -0.01), (1.03, -0.015), (1.04, -0.02), (1.05, -0.025),  
(1.06, -0.03), (1.07, -0.035), (1.08, -0.04), (1.09, -0.045), (1.10, -0.05), (1.11, -0.055),  
(1.12, -0.06), (1.13, -0.065), (1.14, -0.07), (1.15, -0.075), (1.16, -0.08), (1.17, -0.085),  
(1.18, -0.09), (1.19, -0.095), (1.20, -0.1), (1.21, -0.105), (1.22, -0.11), (1.23, -0.115),  
(1.24, -0.12), (1.25, -0.125), (1.26, -0.13), (1.27, -0.135), (1.28, -0.14), (1.29, -0.145),  
(1.30, -0.15)

ROR\_Lith\_migstk\_Lith\_employ\_ch = GRAPH(per\_capita\_Lith\_mig\_stk)  
(0.00, 0.00), (0.05, 0.05), (0.1, 0.1), (0.15, 0.15), (0.2, 0.2), (0.25, 0.25), (0.3, 0.3),  
(0.35, 0.35), (0.4, 0.4), (0.45, 0.45), (0.5, 0.5), (0.55, 0.55), (0.6, 0.6), (0.65, 0.65),  
(0.7, 0.7), (0.75, 0.75), (0.8, 0.8), (0.85, 0.85), (0.9, 0.9), (0.95, 0.95), (1.00, 1.00)

ROR\_Pol\_20\_to\_34\_pop\_Pol\_mig\_rate =  
GRAPH(Percent\_Poland\_20\_to\_34\_Population)  
(0.00, -0.2), (0.1, -0.1), (0.2, 0.00), (0.3, 0.1), (0.4, 0.2), (0.5, 0.3), (0.6, 0.4), (0.7, 0.5),  
(0.8, 0.6), (0.9, 0.7), (1, 0.8)

ROR\_Pol\_GDP\_ch\_pct\_Pol\_coll\_migrants\_ch = GRAPH(ch\_Pol\_GDP)  
(0.7, 0.15), (0.71, 0.145), (0.72, 0.14), (0.73, 0.135), (0.74, 0.13), (0.75, 0.125),  
(0.76, 0.12), (0.77, 0.115), (0.78, 0.11), (0.79, 0.105), (0.8, 0.1), (0.81, 0.095),  
(0.82, 0.09), (0.83, 0.085), (0.84, 0.08), (0.85, 0.075), (0.86, 0.07), (0.87, 0.065),  
(0.88, 0.06), (0.89, 0.055), (0.9, 0.05), (0.91, 0.045), (0.92, 0.04), (0.93, 0.035),  
(0.94, 0.03), (0.95, 0.025), (0.96, 0.02), (0.97, 0.015), (0.98, 0.01), (0.99, 0.005),  
(1.00, 0.00), (1.01, -0.005), (1.02, -0.01), (1.03, -0.015), (1.04, -0.02), (1.05, -0.025),  
(1.06, -0.03), (1.07, -0.035), (1.08, -0.04), (1.09, -0.045), (1.10, -0.05), (1.11, -0.055),  
(1.12, -0.06), (1.13, -0.065), (1.14, -0.07), (1.15, -0.075), (1.16, -0.08), (1.17, -0.085),  
(1.18, -0.09), (1.19, -0.095), (1.20, -0.1), (1.21, -0.105), (1.22, -0.11), (1.23, -0.115),  
(1.24, -0.12), (1.25, -0.125), (1.26, -0.13), (1.27, -0.135), (1.28, -0.14), (1.29, -0.145),  
(1.30, -0.15)

ROR\_Pol\_GDP\_ch\_Pol\_ed\_level\_ch = GRAPH(ch\_Pol\_GDP)  
(0.7, -0.03), (0.71, -0.029), (0.72, -0.028), (0.73, -0.027), (0.74, -0.026), (0.75, -0.025),  
(0.76, -0.024), (0.77, -0.023), (0.78, -0.022), (0.79, -0.021), (0.8, -0.02), (0.81, -0.019),  
(0.82, -0.018), (0.83, -0.017), (0.84, -0.016), (0.85, -0.015), (0.86, -0.014), (0.87, -0.013),  
(0.88, -0.012), (0.89, -0.011), (0.9, -0.01), (0.91, -0.009), (0.92, -0.008), (0.93, -0.007),  
(0.94, -0.006), (0.95, -0.005), (0.96, -0.004), (0.97, -0.003), (0.98, -0.002), (0.99, -0.001),  
(1.00, 0.00), (1.01, 0.001), (1.02, 0.002), (1.03, 0.003), (1.04, 0.004), (1.05, 0.005),  
(1.06, 0.006), (1.07, 0.007), (1.08, 0.008), (1.09, 0.009), (1.10, 0.01), (1.11, 0.011),  
(1.12, 0.012), (1.13, 0.013), (1.14, 0.014), (1.15, 0.015), (1.16, 0.016), (1.17, 0.017),  
(1.18, 0.018), (1.19, 0.019), (1.20, 0.02), (1.21, 0.021), (1.22, 0.022), (1.23, 0.023),  
(1.24, 0.024), (1.25, 0.025), (1.26, 0.026), (1.27, 0.027), (1.28, 0.028), (1.29, 0.029),  
(1.30, 0.03)

ROR\_Pol\_GDP\_ch\_Pol\_employ\_ch = GRAPH(ch\_Pol\_GDP)  
(0.7, -0.3), (0.71, -0.29), (0.72, -0.28), (0.73, -0.27), (0.74, -0.26), (0.75, -0.25),  
(0.76, -0.24), (0.77, -0.23), (0.78, -0.22), (0.79, -0.21), (0.8, -0.2), (0.81, -0.19),  
(0.82, -0.18), (0.83, -0.17), (0.84, -0.16), (0.85, -0.15), (0.86, -0.14), (0.87, -0.13),  
(0.88, -0.12), (0.89, -0.11), (0.9, -0.1), (0.91, -0.09), (0.92, -0.08), (0.93, -0.07),  
(0.94, -0.06), (0.95, -0.05), (0.96, -0.04), (0.97, -0.03), (0.98, -0.02), (0.99, -0.01),  
(1.00, 0.00), (1.01, 0.01), (1.02, 0.02), (1.03, 0.03), (1.04, 0.04), (1.05, 0.05), (1.06, 0.06),  
(1.07, 0.07), (1.08, 0.08), (1.09, 0.09), (1.10, 0.1), (1.11, 0.11), (1.12, 0.12), (1.13, 0.13),  
(1.14, 0.14), (1.15, 0.15), (1.16, 0.16), (1.17, 0.17), (1.18, 0.18), (1.19, 0.19), (1.20, 0.2),  
(1.21, 0.21), (1.22, 0.22), (1.23, 0.23), (1.24, 0.24), (1.25, 0.25), (1.26, 0.26), (1.27, 0.27),  
(1.28, 0.28), (1.29, 0.29), (1.30, 0.3)

ROR\_Pol\_migstk\_Pol\_employ\_ch = GRAPH(per\_capita\_Pol\_mig\_stk)  
(0.00, 0.00), (0.05, 0.05), (0.1, 0.1), (0.15, 0.15), (0.2, 0.2), (0.25, 0.25), (0.3, 0.3),  
(0.35, 0.35), (0.4, 0.4), (0.45, 0.45), (0.5, 0.5), (0.55, 0.55), (0.6, 0.6), (0.65, 0.65),  
(0.7, 0.7), (0.75, 0.75), (0.8, 0.8), (0.85, 0.85), (0.9, 0.9), (0.95, 0.95), (1.00, 1.00)

ROR\_Rom\_20\_to\_34\_pop\_Rom\_mig\_rate =  
GRAPH(Percent\_Romania\_20\_to\_34\_Population)  
(0.00, -0.2), (0.1, -0.1), (0.2, 0.00), (0.3, 0.1), (0.4, 0.2), (0.5, 0.3), (0.6, 0.4), (0.7, 0.5),  
(0.8, 0.6), (0.9, 0.7), (1, 0.8)

ROR\_Rom\_GDP\_ch\_pct\_Rom\_coll\_migrants\_ch = GRAPH(ch\_Rom\_GDP)  
(0.7, 0.15), (0.71, 0.145), (0.72, 0.14), (0.73, 0.135), (0.74, 0.13), (0.75, 0.125),  
(0.76, 0.12), (0.77, 0.115), (0.78, 0.11), (0.79, 0.105), (0.8, 0.1), (0.81, 0.095),  
(0.82, 0.09), (0.83, 0.085), (0.84, 0.08), (0.85, 0.075), (0.86, 0.07), (0.87, 0.065),  
(0.88, 0.06), (0.89, 0.055), (0.9, 0.05), (0.91, 0.045), (0.92, 0.04), (0.93, 0.035),  
(0.94, 0.03), (0.95, 0.025), (0.96, 0.02), (0.97, 0.015), (0.98, 0.01), (0.99, 0.005),  
(1.00, 0.00), (1.01, -0.005), (1.02, -0.01), (1.03, -0.015), (1.04, -0.02), (1.05, -0.025),  
(1.06, -0.03), (1.07, -0.035), (1.08, -0.04), (1.09, -0.045), (1.10, -0.05), (1.11, -0.055),  
(1.12, -0.06), (1.13, -0.065), (1.14, -0.07), (1.15, -0.075), (1.16, -0.08), (1.17, -0.085),  
(1.18, -0.09), (1.19, -0.095), (1.20, -0.1), (1.21, -0.105), (1.22, -0.11), (1.23, -0.115),  
(1.24, -0.12), (1.25, -0.125), (1.26, -0.13), (1.27, -0.135), (1.28, -0.14), (1.29, -0.145),  
(1.30, -0.15)

ROR\_Rom\_GDP\_ch\_Rom\_ed\_level\_ch = GRAPH(ch\_Rom\_GDP)  
(0.7, -0.03), (0.71, -0.029), (0.72, -0.028), (0.73, -0.027), (0.74, -0.026), (0.75, -0.025),  
(0.76, -0.024), (0.77, -0.023), (0.78, -0.022), (0.79, -0.021), (0.8, -0.02), (0.81, -0.019),  
(0.82, -0.018), (0.83, -0.017), (0.84, -0.016), (0.85, -0.015), (0.86, -0.014), (0.87, -0.013),  
(0.88, -0.012), (0.89, -0.011), (0.9, -0.01), (0.91, -0.009), (0.92, -0.008), (0.93, -0.007),  
(0.94, -0.006), (0.95, -0.005), (0.96, -0.004), (0.97, -0.003), (0.98, -0.002), (0.99, -0.001),  
(1.00, 0.00), (1.01, 0.001), (1.02, 0.002), (1.03, 0.003), (1.04, 0.004), (1.05, 0.005),  
(1.06, 0.006), (1.07, 0.007), (1.08, 0.008), (1.09, 0.009), (1.10, 0.01), (1.11, 0.011),  
(1.12, 0.012), (1.13, 0.013), (1.14, 0.014), (1.15, 0.015), (1.16, 0.016), (1.17, 0.017),  
(1.18, 0.018), (1.19, 0.019), (1.20, 0.02), (1.21, 0.021), (1.22, 0.022), (1.23, 0.023),  
(1.24, 0.024), (1.25, 0.025), (1.26, 0.026), (1.27, 0.027), (1.28, 0.028), (1.29, 0.029),  
(1.30, 0.03)

ROR\_Rom\_GDP\_ch\_Rom\_employ\_ch = GRAPH(ch\_Rom\_GDP)  
(0.7, -0.3), (0.71, -0.29), (0.72, -0.28), (0.73, -0.27), (0.74, -0.26), (0.75, -0.25),  
(0.76, -0.24), (0.77, -0.23), (0.78, -0.22), (0.79, -0.21), (0.8, -0.2), (0.81, -0.19),  
(0.82, -0.18), (0.83, -0.17), (0.84, -0.16), (0.85, -0.15), (0.86, -0.14), (0.87, -0.13),  
(0.88, -0.12), (0.89, -0.11), (0.9, -0.1), (0.91, -0.09), (0.92, -0.08), (0.93, -0.07),  
(0.94, -0.06), (0.95, -0.05), (0.96, -0.04), (0.97, -0.03), (0.98, -0.02), (0.99, -0.01),  
(1.00, 0.00), (1.01, 0.01), (1.02, 0.02), (1.03, 0.03), (1.04, 0.04), (1.05, 0.05), (1.06, 0.06),  
(1.07, 0.07), (1.08, 0.08), (1.09, 0.09), (1.10, 0.1), (1.11, 0.11), (1.12, 0.12), (1.13, 0.13),  
(1.14, 0.14), (1.15, 0.15), (1.16, 0.16), (1.17, 0.17), (1.18, 0.18), (1.19, 0.19), (1.20, 0.2),  
(1.21, 0.21), (1.22, 0.22), (1.23, 0.23), (1.24, 0.24), (1.25, 0.25), (1.26, 0.26), (1.27, 0.27),  
(1.28, 0.28), (1.29, 0.29), (1.30, 0.3)

ROR\_Rom\_migstk\_Rom\_employ\_ch = GRAPH(per\_capita\_Rom\_mig\_stk)  
(0.00, 0.00), (0.05, 0.05), (0.1, 0.1), (0.15, 0.15), (0.2, 0.2), (0.25, 0.25), (0.3, 0.3),  
(0.35, 0.35), (0.4, 0.4), (0.45, 0.45), (0.5, 0.5), (0.55, 0.55), (0.6, 0.6), (0.65, 0.65),  
(0.7, 0.7), (0.75, 0.75), (0.8, 0.8), (0.85, 0.85), (0.9, 0.9), (0.95, 0.95), (1.00, 1.00)

ROR\_Slv\_20\_to\_34\_pop\_Slv\_mig\_rate =  
GRAPH(Percent\_Slovenia\_20\_to\_34\_Population)  
(0.00, -0.2), (0.1, -0.1), (0.2, 0.00), (0.3, 0.1), (0.4, 0.2), (0.5, 0.3), (0.6, 0.4), (0.7, 0.5),  
(0.8, 0.6), (0.9, 0.7), (1, 0.8)

ROR\_Slv\_GDP\_ch\_pct\_Slv\_coll\_migrants\_ch = GRAPH(ch\_Slv\_GDP)  
(0.7, 0.15), (0.71, 0.145), (0.72, 0.14), (0.73, 0.135), (0.74, 0.13), (0.75, 0.125),  
(0.76, 0.12), (0.77, 0.115), (0.78, 0.11), (0.79, 0.105), (0.8, 0.1), (0.81, 0.095),  
(0.82, 0.09), (0.83, 0.085), (0.84, 0.08), (0.85, 0.075), (0.86, 0.07), (0.87, 0.065),  
(0.88, 0.06), (0.89, 0.055), (0.9, 0.05), (0.91, 0.045), (0.92, 0.04), (0.93, 0.035),  
(0.94, 0.03), (0.95, 0.025), (0.96, 0.02), (0.97, 0.015), (0.98, 0.01), (0.99, 0.005),  
(1.00, 0.00), (1.01, -0.005), (1.02, -0.01), (1.03, -0.015), (1.04, -0.02), (1.05, -0.025),  
(1.06, -0.03), (1.07, -0.035), (1.08, -0.04), (1.09, -0.045), (1.10, -0.05), (1.11, -0.055),  
(1.12, -0.06), (1.13, -0.065), (1.14, -0.07), (1.15, -0.075), (1.16, -0.08), (1.17, -0.085),  
(1.18, -0.09), (1.19, -0.095), (1.20, -0.1), (1.21, -0.105), (1.22, -0.11), (1.23, -0.115),  
(1.24, -0.12), (1.25, -0.125), (1.26, -0.13), (1.27, -0.135), (1.28, -0.14), (1.29, -0.145),  
(1.30, -0.15)

ROR\_Slv\_GDP\_ch\_Slv\_ed\_level\_ch = GRAPH(ch\_Slv\_GDP)  
(0.7, -0.03), (0.71, -0.029), (0.72, -0.028), (0.73, -0.027), (0.74, -0.026), (0.75, -0.025),  
(0.76, -0.024), (0.77, -0.023), (0.78, -0.022), (0.79, -0.021), (0.8, -0.02), (0.81, -0.019),  
(0.82, -0.018), (0.83, -0.017), (0.84, -0.016), (0.85, -0.015), (0.86, -0.014), (0.87, -0.013),  
(0.88, -0.012), (0.89, -0.011), (0.9, -0.01), (0.91, -0.009), (0.92, -0.008), (0.93, -0.007),  
(0.94, -0.006), (0.95, -0.005), (0.96, -0.004), (0.97, -0.003), (0.98, -0.002), (0.99, -0.001),  
(1.00, 0.00), (1.01, 0.001), (1.02, 0.002), (1.03, 0.003), (1.04, 0.004), (1.05, 0.005),  
(1.06, 0.006), (1.07, 0.007), (1.08, 0.008), (1.09, 0.009), (1.10, 0.01), (1.11, 0.011),  
(1.12, 0.012), (1.13, 0.013), (1.14, 0.014), (1.15, 0.015), (1.16, 0.016), (1.17, 0.017),  
(1.18, 0.018), (1.19, 0.019), (1.20, 0.02), (1.21, 0.021), (1.22, 0.022), (1.23, 0.023),  
(1.24, 0.024), (1.25, 0.025), (1.26, 0.026), (1.27, 0.027), (1.28, 0.028), (1.29, 0.029),  
(1.30, 0.03)

ROR\_Slv\_GDP\_ch\_Slv\_employ\_ch = GRAPH(ch\_Slv\_GDP)  
(0.7, -0.3), (0.71, -0.29), (0.72, -0.28), (0.73, -0.27), (0.74, -0.26), (0.75, -0.25),  
(0.76, -0.24), (0.77, -0.23), (0.78, -0.22), (0.79, -0.21), (0.8, -0.2), (0.81, -0.19),  
(0.82, -0.18), (0.83, -0.17), (0.84, -0.16), (0.85, -0.15), (0.86, -0.14), (0.87, -0.13),  
(0.88, -0.12), (0.89, -0.11), (0.9, -0.1), (0.91, -0.09), (0.92, -0.08), (0.93, -0.07),  
(0.94, -0.06), (0.95, -0.05), (0.96, -0.04), (0.97, -0.03), (0.98, -0.02), (0.99, -0.01),  
(1.00, 0.00), (1.01, 0.01), (1.02, 0.02), (1.03, 0.03), (1.04, 0.04), (1.05, 0.05), (1.06, 0.06),  
(1.07, 0.07), (1.08, 0.08), (1.09, 0.09), (1.10, 0.1), (1.11, 0.11), (1.12, 0.12), (1.13, 0.13),  
(1.14, 0.14), (1.15, 0.15), (1.16, 0.16), (1.17, 0.17), (1.18, 0.18), (1.19, 0.19), (1.20, 0.2),  
(1.21, 0.21), (1.22, 0.22), (1.23, 0.23), (1.24, 0.24), (1.25, 0.25), (1.26, 0.26), (1.27, 0.27),  
(1.28, 0.28), (1.29, 0.29), (1.30, 0.3)

ROR\_Slv\_migstk\_Slv\_employ\_ch = GRAPH(per\_capita\_Slv\_mig\_stk)  
(0.00, 0.00), (0.05, 0.05), (0.1, 0.1), (0.15, 0.15), (0.2, 0.2), (0.25, 0.25), (0.3, 0.3),  
(0.35, 0.35), (0.4, 0.4), (0.45, 0.45), (0.5, 0.5), (0.55, 0.55), (0.6, 0.6), (0.65, 0.65),  
(0.7, 0.7), (0.75, 0.75), (0.8, 0.8), (0.85, 0.85), (0.9, 0.9), (0.95, 0.95), (1.00, 1.00)

ROR\_Svk\_20\_to\_34\_pop\_Svk\_mig\_rate =  
GRAPH(Percent\_Slovakia\_20\_to\_34\_Population)  
(0.00, -0.2), (0.1, -0.1), (0.2, 0.00), (0.3, 0.1), (0.4, 0.2), (0.5, 0.3), (0.6, 0.4), (0.7, 0.5),  
(0.8, 0.6), (0.9, 0.7), (1, 0.8)

ROR\_Svk\_GDP\_ch\_pct\_Svk\_coll\_migrants\_ch = GRAPH(ch\_Svk\_GDP)  
(0.7, 0.15), (0.71, 0.145), (0.72, 0.14), (0.73, 0.135), (0.74, 0.13), (0.75, 0.125),  
(0.76, 0.12), (0.77, 0.115), (0.78, 0.11), (0.79, 0.105), (0.8, 0.1), (0.81, 0.095),  
(0.82, 0.09), (0.83, 0.085), (0.84, 0.08), (0.85, 0.075), (0.86, 0.07), (0.87, 0.065),  
(0.88, 0.06), (0.89, 0.055), (0.9, 0.05), (0.91, 0.045), (0.92, 0.04), (0.93, 0.035),  
(0.94, 0.03), (0.95, 0.025), (0.96, 0.02), (0.97, 0.015), (0.98, 0.01), (0.99, 0.005),  
(1.00, 0.00), (1.01, -0.005), (1.02, -0.01), (1.03, -0.015), (1.04, -0.02), (1.05, -0.025),  
(1.06, -0.03), (1.07, -0.035), (1.08, -0.04), (1.09, -0.045), (1.10, -0.05), (1.11, -0.055),  
(1.12, -0.06), (1.13, -0.065), (1.14, -0.07), (1.15, -0.075), (1.16, -0.08), (1.17, -0.085),  
(1.18, -0.09), (1.19, -0.095), (1.20, -0.1), (1.21, -0.105), (1.22, -0.11), (1.23, -0.115),  
(1.24, -0.12), (1.25, -0.125), (1.26, -0.13), (1.27, -0.135), (1.28, -0.14), (1.29, -0.145),  
(1.30, -0.15)

ROR\_Svk\_GDP\_ch\_Svk\_ed\_level\_ch = GRAPH(ch\_Svk\_GDP)  
(0.7, -0.03), (0.71, -0.029), (0.72, -0.028), (0.73, -0.027), (0.74, -0.026), (0.75, -0.025),  
(0.76, -0.024), (0.77, -0.023), (0.78, -0.022), (0.79, -0.021), (0.8, -0.02), (0.81, -0.019),  
(0.82, -0.018), (0.83, -0.017), (0.84, -0.016), (0.85, -0.015), (0.86, -0.014), (0.87, -0.013),  
(0.88, -0.012), (0.89, -0.011), (0.9, -0.01), (0.91, -0.009), (0.92, -0.008), (0.93, -0.007),  
(0.94, -0.006), (0.95, -0.005), (0.96, -0.004), (0.97, -0.003), (0.98, -0.002), (0.99, -0.001),  
(1.00, 0.00), (1.01, 0.001), (1.02, 0.002), (1.03, 0.003), (1.04, 0.004), (1.05, 0.005),  
(1.06, 0.006), (1.07, 0.007), (1.08, 0.008), (1.09, 0.009), (1.10, 0.01), (1.11, 0.011),  
(1.12, 0.012), (1.13, 0.013), (1.14, 0.014), (1.15, 0.015), (1.16, 0.016), (1.17, 0.017),  
(1.18, 0.018), (1.19, 0.019), (1.20, 0.02), (1.21, 0.021), (1.22, 0.022), (1.23, 0.023),  
(1.24, 0.024), (1.25, 0.025), (1.26, 0.026), (1.27, 0.027), (1.28, 0.028), (1.29, 0.029),  
(1.30, 0.03)

ROR\_Svk\_GDP\_ch\_Svk\_employ\_ch = GRAPH(ch\_Svk\_GDP)  
(0.7, -0.3), (0.71, -0.29), (0.72, -0.28), (0.73, -0.27), (0.74, -0.26), (0.75, -0.25),  
(0.76, -0.24), (0.77, -0.23), (0.78, -0.22), (0.79, -0.21), (0.8, -0.2), (0.81, -0.19),  
(0.82, -0.18), (0.83, -0.17), (0.84, -0.16), (0.85, -0.15), (0.86, -0.14), (0.87, -0.13),  
(0.88, -0.12), (0.89, -0.11), (0.9, -0.1), (0.91, -0.09), (0.92, -0.08), (0.93, -0.07),  
(0.94, -0.06), (0.95, -0.05), (0.96, -0.04), (0.97, -0.03), (0.98, -0.02), (0.99, -0.01),  
(1.00, 0.00), (1.01, 0.01), (1.02, 0.02), (1.03, 0.03), (1.04, 0.04), (1.05, 0.05), (1.06, 0.06),  
(1.07, 0.07), (1.08, 0.08), (1.09, 0.09), (1.10, 0.1), (1.11, 0.11), (1.12, 0.12), (1.13, 0.13),  
(1.14, 0.14), (1.15, 0.15), (1.16, 0.16), (1.17, 0.17), (1.18, 0.18), (1.19, 0.19), (1.20, 0.2),  
(1.21, 0.21), (1.22, 0.22), (1.23, 0.23), (1.24, 0.24), (1.25, 0.25), (1.26, 0.26), (1.27, 0.27),  
(1.28, 0.28), (1.29, 0.29), (1.30, 0.3)

ROR\_Svk\_migstk\_Svk\_employ\_ch = GRAPH(per\_capita\_Svk\_mig\_stk)  
(0.00, 0.00), (0.05, 0.05), (0.1, 0.1), (0.15, 0.15), (0.2, 0.2), (0.25, 0.25), (0.3, 0.3),  
(0.35, 0.35), (0.4, 0.4), (0.45, 0.45), (0.5, 0.5), (0.55, 0.55), (0.6, 0.6), (0.65, 0.65),  
(0.7, 0.7), (0.75, 0.75), (0.8, 0.8), (0.85, 0.85), (0.9, 0.9), (0.95, 0.95), (1.00, 1.00)

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<sup>1</sup> One related notion that is not part of the discussion here is Easton's (1965) form of systems analysis (Penn). It seems as though his ideas stem from the same intellectual ferment that created the systems modeling under examination here, but Easton adopts a structural-functional construction that what this research is interested in employing does not.

<sup>2</sup> In his article celebrating the fiftieth anniversary of system dynamics' genesis, Sterman (2007, 89) implies that this literature did not really flourish until Jay Forrester's writings of the late 1950s. On the other hand, Sterman also admits that any dating of the birth of a new academic field is always imprecise and subject to error.

<sup>3</sup> Since the terminology employed in systems modeling often becomes quite confusing and imprecise (Hoos, 124), it is critical to expend a moment explicitly defining some important terms used in this area. A model is an "idealized representation of reality describing some phenomenon whose behavior is to be highlighted" (Clark and Cole, 33). A system, however, is a "set of at least two interconnected elements such that each element is related to all other elements, either directly or indirectly" (Clark and Cole, 31). Please keep in mind that the generality of this definition implies that setting appropriate boundaries of the system of interest is an extremely important first step to any study that utilizes systems modeling (Sterman 2000, 97-99). General systems theory is an "attempt to formulate and develop principles which hold for systems in general" (Clark and Cole, 32), while system dynamics is the field of study concerned with understanding how complex systems operate (Sterman 2000, 4-5). Systems analysis is also a commonly used term in this field, but because it can be confused with Easton's work (see earlier endnote), this research avoids using this expression whenever possible. The definitions of systems thinking, systems theory and systems modeling that are given in the main body of the text are also operative throughout this research.

<sup>4</sup> Another notion (Klir, 99) that appeared during the search for a general systems theory is fuzzy systems (Klir et. al.), the idea that systems can take values from sets that are not precisely specified. This concept is most closely associated with the work of Lotfi Zadeh (for citations, see Klir, 99).

<sup>5</sup> For a view of how political science and general systems theory interact within the literature, please see Harrison and Singer (2006), which describes Singer's (1971) concerted attempt to create a taxonomy of general systems theory for the discipline.

<sup>6</sup> Although the commentary for this work (Meadows et. al. 1972, 185) insists that it is not a piece of futurology, that is how it was taken by a large portion of the book's contemporary audience. Over the next few decades, as some of the forecasts of its models turned out to be inaccurate, critics of the study's conclusions seized upon those "failures" to try to discredit the entire work and its methodology. Interestingly enough, the origins of some of the current partisan struggles over the regulation of greenhouse gas emissions (Meadows et. al. 1972, 71-73) could arguably be located in the fight over the conclusions of this book. For a more in-depth examination of the roles that systems modeling could play in the debates over global climate change, please see Sterman (2000, 241-249).

<sup>7</sup> This statement is not meant to imply that systems modeling cannot be used in other contexts that might be applicable to the study of labor migration. For instance, Gonçalves et. al. (2005) utilize this tool to examine business supply-chain endogeneity in push-pull systems.

<sup>8</sup> A possible example of this problem is Meadows et. al. (1982), which uses colored paper and non-traditional poetry to capture the reader's attention. Even one of Kenneth Boulding's (1978) famous books has a rather non-social scientific ambiance to it.

<sup>9</sup> Perhaps demonstrating that system dynamics scholars have a sense of humor about themselves, Meadows et. al. (1982, 31, 95) reprints two *New Yorker* cartoons concerning the controversy surrounding the Club of Rome models.

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<sup>10</sup> One difficulty with citing Hoos' book as a criticism of systems modeling per se is that she also attacks methods (like cost-benefit analysis and technology assessments) that lie outside of the subject under discussion here (Hoos, 136-146, 294-300).

<sup>11</sup> A similar explication of systems thinking concepts can be located in Richmond (2004, 10-26).

<sup>12</sup> Similarly, a person's consciousness can only be perceived if the brain is working properly and is supported by the respiratory, circulatory, nervous, and other bodily systems; one cannot dissect even a living brain to find where consciousness resides.

<sup>13</sup> As demonstrated by Kelley and Schmidt (1995, 546-547), "stock and flow" terminology is not utilized by systems modeling exclusively. However, these concepts are quite basic to how systems modelers think about the natural, social and economic worlds that they explore.

<sup>14</sup> Sterman (2000, 202-205) explicates converters in his discussion of intermediate or auxiliary variables, which include not only constants or exogenous inputs to flow rates but also functions of stocks based on feedback loops or state-determined variables. For example, an increase in per capita food availability leads to short-term increases in a region's net birth rate (flow) and population (stock). However, that increase in population (everything else equal) eventually reduces the available amount of food per capita, the net birth rate, and (in drastic, long-run cases) the population of that region.

<sup>15</sup> Since stock levels may only change through their flow rates, converters may never directly influence stocks (Sterman 2000, 204-205). To return to the grammar analogy once more, converters are adverbs, not adjectives!

<sup>16</sup> Similar descriptions of the model construction and testing process can be found in Richmond (2004, 109-120) and Clark and Cole (1975, 56-69).

<sup>17</sup> STELLA is proprietary software of Isee Systems Incorporated ([www.iseesystems.com](http://www.iseesystems.com)); version 9.1.2 is used for this analysis under perpetual license to the author.

<sup>18</sup> For example, a naive observer of sports might assume that an all-star team would naturally be the best possible combination of players for that sport. However, the emergent properties of team dynamics and inter-player cooperation usually make that all-star squad a less effective collection of players than a less-talented team that has been playing together for an entire season.

<sup>19</sup> Of course, one could discover how a system reacts in the future by waiting until these events transpire, but that would obviate the need for creating projection models and take a long time to boot.

<sup>20</sup> In fact, Richmond (2004, 109) begins his description of systems model writing with almost an entire page of quotes that express this sentiment.

<sup>21</sup> Both sensitivity analysis and behavioral reproduction tests can have statistical footings (Sterman 2000, 874-876, 884-887), but there is no equivalent to an F-test for entire systems models or a t-test for individual relationships within models. That kind of testing information would need to be derived from explicitly statistical models in the literature on the subject in question or from separate research conducted by the investigator.

<sup>22</sup> For example, a systems model of production facilities at the DuPont Corporation convinced management personnel there that the financial benefits of short-term reductions in maintenance and repair costs had been creating vicious long-term cycles in which far more money was being lost to downtime than was being saved by the initial work reductions. The insights generated by the DuPont model have been successfully applied at other plants that were facing the same negative reinforcing cycle of low maintenance and high repair costs (Sterman 2000, 66-73).

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<sup>23</sup> One exception to this statement is the incomplete model of the governance structure of the Oneida Nation described by Gharajedaghi (1999, 155-162).

<sup>24</sup> As noted earlier, the political effects of temporary and permanent migration may be quite different. Politicians in receiver countries may be pressured to react to small levels of permanent migration that would be ignored if the worker migration were merely temporary because of the demographic changes that the former type of movement implies. Network theory also contends that having some volume of long-term migration from one country to another eases the way for later workers to make the same trip. That effect would obviously not exist, or at least be much weaker, if the migration were only short-term. However, large-scale deluges of even temporary migrants would still likely force receiving countries to limit their acceptance of future economic migrants in order to prevent serious disequilibria in their labor markets. This process appears to be behind the differing policy responses of the UK government to the 2004 and 2007 EU accession rounds (Drew and Sriskandarajah), especially since those reactions seem to have been based on the gross CEEC8 worker migration to the UK.

<sup>25</sup> Although the political effect would be the same in both economies (i.e., tighter restrictions on worker mobility), the reasons for those limits might be quite different. In the receiver country, local workers would probably be alarmed about increased competition for their jobs and demand that their government protect them. In the sender country, fears of a “brain drain” (Frey; Straubhaar and Wolburg; Favell et. al., 11-13; Brücker and Damelang, 29-31) could lead the sender government to implement policies that would encourage their most skilled and educated workers to stay in the national economy. In addition, the sender government would likely place a higher premium on economic development measures that would hopefully slow the flow of their workers to other countries.

<sup>26</sup> Those negative economic effects did not occur in the newly expanded EU, not even the UK or Poland, in the few years just after the 2004 accession round (European Commission 2006, 10), but they might happen in other cases.

<sup>27</sup> The main problem with separately tracking gross worker inflows and outflows between the CEEC10 and Germany is that the GDP effect on migration assumption would be different here from that which has been presumed up to this point in the analysis. In the net migration statistical model, the guiding supposition is that the change in the GDP ratio between the two involved countries creates the push-pull effects necessary for net migration to occur. In a study of gross migration, the individual changes to national GDP in the CEE countries and Germany generate separate pressures for migrants to leave home and take up employment in the receiver country, respectively. That difference is a subtle but important theoretical distinction that would make comparing the statistical models’ outcomes and those of the gross systems models’ net migration results inappropriate. While it might be reasonable to compare two different systems models’ net migration figures (one with gross migration and another with net migration as its structural basis), when the goal is to contrast results derived from a statistical study of net migration with those taken from a systems model investigation of worker movement, the underlying assumptions must be as similar as possible. Another issue related to the decision to construct solely a net migration-based systems model in this analysis involves how the software for this technique is designed. In general, when one assumes that the causal mechanisms that create flows in and out of a stock are the same, which is the case here, one should represent those movements as biflows (two-directional flows that appear as double-headed flows in pictorial representations of systems models). If one contends that the inflow and outflow determinants are different, which would be true in a gross migration-based model, then they should be represented as separate one-directional uniflows (Richmond, 40). Although it is certainly possible to build models with separate uniflows in and out of the relevant stocks, these models tend to be more visually and mathematically complex and thus more difficult to understand and explain. For the sake of simplicity on more than one level, the adoptions of biflows and the assumption of identical causal flow mechanisms are made here.

<sup>28</sup> The directions of these relationships are represented in the causal loop diagram by the positive and negative signs located at the relevant arrowheads, respectively.

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<sup>29</sup> The one balancing (B<sub>1</sub>) and two reinforcing (R<sub>1</sub> and R<sub>2</sub>) loops are the result of the inclusion of these new variables and feedback structures. Further loops involving these variables are possible if certain other relationships are postulated here, but there are very good reasons for omitting those interactions, as a later section demonstrates. As an aside, one simple way to tell the difference between a reinforcing and a balancing loop is to count the number of negative links in the loop (Sterman 2000, 144). An odd number of negative relationships indicates the presence of a balancing loop, while an even number of negative links (including zero) demonstrates that a reinforcing loop is under examination.

<sup>30</sup> At this juncture, it should be observed that this portion of the discussion is constructed somewhat differently from the corresponding part of the statistical modeling chapter. In particular, there are no explicit hypothesis statements in this material. That omission is due to the fact that, as stated previously, systems modeling rarely allows standard hypothesis testing to be performed. These relationships are really more like geometric postulates than hypotheses in the social scientific sense of that term. When systems modelers speak of “dynamic hypotheses”, they are really referring more to how they initially expect an entire model to behave due to its endogenous features than how individual building blocks within that model will act (Sterman 2000, 86-87, 94-102). Using this definition as a reference point, one could state that the dynamic hypothesis of the systems model explicated here is that its endogenous and exogenous variables should impel relatively few future CEEC10 workers to take jobs in the EU15 countries.

<sup>31</sup> In fact, similar statements could be made concerning most of the new relationships explicated below.

<sup>32</sup> For all five of the relationships that employ change in GDP as their base, a zero-percent increase in GDP generates no change in the second variable. In other words, a positive change in GDP engenders a positive change in the companion variable, and a negative GDP change produces a negative shift in the second variable.

<sup>33</sup> Most of these new relationships are programmed into STELLA using graphical functions, which are tools that can be utilized to visually or tabularly articulate the relationships between input and output variables (Richmond, 81-83, 90-94). Graphical functions operate on an explicit *ceteris paribus* principle where one must estimate them assuming that all other factors that may influence the relationship being programmed are held constant. They can be identified in stock and flow diagrams as converters with a small tilde near the bottom of the circle. In this analysis, they can also be recognized by the prefix “ROR” in their names (for instance, the two functions under discussion here are entitled “ROR <donor country> GDP ch <donor country> employ ch” and “ROR German GDP ch German employ ch”, respectively). The prefix stands for “rate of return”; while these functions are not literally rates of return in the economic sense, they could remind one of this idea enough that the prefix could become a handy tool for quickly comprehending the purpose of these converters.

<sup>34</sup> It should be noted here that STELLA’s architecture necessitates a modification in how changes in the GDP ratio stocks are calculated in the systems models compared to how those operations are carried out in the statistical models. During the statistical models’ projection calculations, each year’s national GDP ratio variables are determined by dividing the previous year’s ratios by 1.02 (or whatever the convergence factor is in that run). However, it is impossible to compute these stocks’ values by this method in STELLA; instead, the following formula is used:

$$\text{GDP Ratio}_t = \text{GDP Ratio}_{t-1} - [(\text{GDP convergence factor} - 1) * \text{GDP Ratio}_{t-1}].$$

The results of these calculations grant figures that are very close, but not identical, to what one would acquire through the method that is utilized in the statistical models. Therefore, it is necessary to reperform the forecast for one country’s worker migration (Bulgaria) using the baseline assumptions described in the previous chapter to determine if this change has any noticeable effect on the final results of these operations. In the end, it so happens that this methodological shift has only a negligible impact on the relevant outcome (i.e., a reduction of about eight migrants out of the roughly 81,000 who are predicted to leave Bulgaria for Germany between 2004 and 2030; the exact numbers are available upon request).

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<sup>35</sup> This contention assumes that the sender-country's population does not increase faster than its migrant stock does. Given the population projections for the CEEC10 over the time period of these forecasts, this presumption seems quite reasonable.

<sup>36</sup> The graphical function for this relationship covers all logical possibilities for the value of per capita migrant stock (zero to one; i.e., zero to one-hundred percent). Should this model ever generate numbers beyond these limits, one would immediately know that something had gone quite awry with it. A similar statement could be made for the other graphical functions, even the ones for which there is no natural limit on the span of values that their base variables could take. In particular, the graphical functions involving GDP are tabulated for figures ranging from a thirty percent annual decrease in GDP to a thirty percent annual increase in that statistic; the education-related graphical functions utilize numbers that span from zero to thirty average years of schooling; and the one graphical function related to sender-country young adult population covers the entire logical extent of that value (zero to one-hundred percent). For the first two of these graphical functions, even though theoretically there could be values that could appear outside those ranges, such values have never been detected in the real world (Richmond, 92). In fact, the limits set by these functions encompass even the extremes that have been recorded for annual GDP change and average education well.

<sup>37</sup> The average number of years of education for workers in each sender country is calculated by multiplying the percentages from the appropriate table by the estimated average number of years that it takes to complete that level of education. "No schooling" is thus defined as zero years, "incomplete primary education" as four years, "primary" education as six years, "lower secondary" education as nine years, "upper secondary" education as twelve years, "post-secondary non-tertiary" education as fourteen years, and "tertiary" education as seventeen years of education. These average number of years values are based on the International Standard Classification of Education (ISCED97) definitions listed in an appendix in UNESCO Institute for Statistics (2008, 292-293). In cases where national statistical agencies do not separate their categories in the way the ISCED97 classifications do, the relevant numbers are combined with the closest available category. (For instance, several countries do not provide percentages for "no schooling" and "incomplete primary" education, so those figures are reported as part of the "primary" education category as well.) These data are only available from the national education agencies on a sporadic basis; some of the CEE countries' data are thus from before 2004 and some are from after that year. Further complicating matters, UNESCO apparently only started collecting and reporting these latest-available data with the 2008 edition of this volume (perusals of earlier volumes for these data turn up nothing). Although it may seem that the use of this data source violates the principle that this analysis would only use information that EU15 decision-makers would have had on hand in 2004, average education levels change only very slowly (and likely would have been available to these decision-makers from other sources), and these are the best-available data with which to program the model. Finally, the Polish government report no relevant education data to UNESCO in any year, so the average value for the other nine CEE member states (11.781 years of education) is used to program this country's stock initially.

<sup>38</sup> This issue has even affected American politics over the past few decades, as Midwestern state politicians have tried using a variety of methods to convince young graduates of its universities to stay in their states rather than depart for other areas of the country for work (Mattoon, 2-3; Paulson).

<sup>39</sup> A linear relationship between these two variables above and below twelve years of education is still assumed here, but the education variable has a positive impact on the migration rate above twelve years of education and a negative effect below that value. At exactly twelve years of education, this variable has no independent effect on the sender-country's migration rate.

<sup>40</sup> Due to technical constraints of the STELLA software program, this relationship is actually programmed in a graphical function in the model as a 0.01 increase per year of education. It is then divided by 10,000 ( $1 \times 10^4$ ) in the migration rate equation itself to arrive at the  $1 \times 10^{-6}$  effect.

<sup>41</sup> It should be kept in mind here that the addition of this variable to the model implies that the convergence factor is no longer exactly two percent per projection year (or whatever it is supposed to be for the model

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run under examination). The convergence factor value is affected by this function so that it is now two percent per year plus or minus the education level-GDP function result. This modification is justifiable in that more-educated countries tend to grow faster than ones with reduced levels of education, and this alteration permits countries to vary on this measure in a uniformly determined fashion. However, when comparing the results of the systems models to those of the statistical models described earlier, one must be aware of the changes in how the convergence factor is calculated.

<sup>42</sup> At least one study of post-accession CEE worker migration attempts to take age into account in its projection of future worker movements. Fertig and Schmidt (2000, 21-25, 35-37) find that the migration rate among younger CEEC4 (Poland, Hungary, Czech Republic, Estonia) workers is higher than that of the population as a whole and that overall forecast worker movement is likely to be reduced by the fact that CEE societies are aging just like their Western European counterparts are. However, this study is not entirely applicable to this investigation due to their definition of “younger workers” (people aged zero to thirty-nine) and their focus on fewer countries than the present analysis contains.

<sup>43</sup> It should be noted here that the age structures of the CEEC10 are treated by this model as exogenous, and that a future revision of this systems model should attempt to endogenize this factor, if possible.

<sup>44</sup> Due to a limitation in the graphical function code in STELLA, this relationship is actually entered as a 0.01 increase in migration rate per one-percent enlargement in young worker proportion and is then divided by 10,000 in the migration rate equation itself.

<sup>45</sup> Technically, utilizing the 2005 rather than the 2003 data is a violation of the working presumption that this analysis only employs information that would have been available to decision-makers in 2004. However, similar figures would have been obtainable by them from the then most-recent UN Demographic Yearbook, and these values do not change very rapidly over only a few years. More importantly, this data source is the same one that is used for some of the population change projections referenced in the statistical model section of this study, and it is reasonable to bend the data availability rule a little to ensure that the same data sources are used wherever practicable. The World Development Indicators source is also utilized to provide projections of how the CEEC10 young worker proportion is forecast to change over the next several decades, as is seen momentarily.

<sup>46</sup> This calculation is made by determining the projected 2030 young worker population proportion, subtracting the 2005 proportion from it, and then dividing by twenty-five. Although it would be better if the 2003 numbers could be utilized here, data availability and other considerations described in a previous endnote make that goal difficult to accomplish. Since the World Bank forecasts overall declines in this age group’s population proportion for all ten CEE countries, these figures are referred to in the model as decreases of the sender countries’ twenty to thirty-four year old population rather than changes in that percentage.

<sup>47</sup> Again, the use of these data could be perceived as a violation of the principle that this study only utilizes information available at the time of CEEC8 accession. However, since the purpose of this exercise is purely descriptive (i.e., these figures are not employed to determine migration rates), this objection does not raise any fatal issues for this part of the analysis. In addition, estimates of the age structure of CEE worker flow could easily have been created using the migration theory and data available in 2004. However, one must be cautious about exploiting the Brücker and Damelang (2009, 32) figures because they are for the working-age population only rather than the population as a whole.

<sup>48</sup> One intriguing feature of the combination of projected declining young-person population share and a forecast of the percentage of the migrant population that will fall into that group is that such forecasts follow the predictions of cumulative causation migration theory (Massey et. al., 45-50) almost inadvertently. This theory argues that migrant populations start to resemble the home population’s demographic profile (age, skill and education) more closely as time passes. Since an outsized part of the migrant population is composed of young people and that fraction decreases over time, according to these projections, these forecasts appear to follow this theory.

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<sup>49</sup> An interesting side note can be derived from a quick visual inspection of these data. It is apparent from such an assessment that the countries that have the worst-performing economies in 2006 also seem to be the ones that have the greatest percentage of college-educated migrants move to the EU15 countries during that year. There are a few exceptions to that rule (the Czech Republic's percentage is higher than one might expect, while Romania's is lower), but the underlying pattern is fairly clear.

<sup>50</sup> These 2006 data are also disputable because they could not have been known by EU15 policymakers at the time of CEEC8 accession in 2004, even if alternative data sources might have given them some estimates of that figure based on previous flows from non-CEE countries. Additionally, these data are for the CEEC10 citizens in the EU15 member states as a whole rather than just Germany. However, since these figures are being used for purely descriptive purposes, these data difficulties should not affect this study's overall conclusions about the magnitude of future CEEC10 migration to Western Europe and what the general policy responses should be to this event. Even if they are only able to grant an approximate sense of how many college migrants there might be in this worker migration flow, it would be better than nothing (as long as the above caveats are kept in mind, of course). It might also be noted here that the authors (Brücker and Damelang, 25) equate high skill level with having a tertiary degree. Their classifications of "high skill level" are based on the same ISCED97 categories utilized in the operationalization of the education level variable in this study.

<sup>51</sup> The model is currently constructed in STELLA so that one might be able to make that calculation legitimately should a future version of this model locate appropriate data to fill that stock. However, the numbers of sender-country college-educated worker migrants derived from these experiments are not reported here for obvious reasons.

<sup>52</sup> Due to a limitation in the construction of the graphical function interface in STELLA, this relationship is actually programmed into the model as a 0.005 college-educated migrant increase per 0.01 increase in German GDP. The resulting number from the graphical function is then divided by ten in the change in college-educated migrant equations. A nearly identical statement can be made about the relationship between increases in sender-country GDP and the change in the college-educated migrant percentages.

<sup>53</sup> An astute observer might be tempted at this point to inquire as to how any causal loop relationships can be modeled if that is the case. The rule of thumb in these instances is that the presence of a stock must intervene in the loop in order for it to be functional. Stocks are accumulations and thus have persistence (Richmond, 41-42); flows and converters are instantaneous and perishable indications of the value of certain phenomena. The presence of a stock in a balancing or reinforcing loop obviates the issue of having two or more flows or converters (two converters in the present case) simultaneously and instantaneously determining the value of each other. One way to keep the different implications of a stock and flow or converter in mind is to imagine that the system of interest seized up and everything in it stopped moving; the values of the flows (and many of the converters as well) would immediately fall to zero, while the stocks' values would remain in place.

<sup>54</sup> A further potential interaction involving net worker migrants that is excluded from this systems model is the one from this variable to sender-country employment. This relationship is not included here because sender-country employment is already indirectly influenced by net migrants through per capita migrant stock.

<sup>55</sup> It should be noted here that the way in which these World Bank population projection data are utilized in the two "baseline" models is somewhat different. In the statistical model, each five-year (e.g., 2015-2020) average annual rate change in the sender-country's population is utilized for that time period (with the 2005-2010 shift employed for 2004 as well). However, due to programming restrictions in the systems modeling software that make it difficult for user-determined converter values to be adjusted during a run, the average value for all of those five-year average annual changes is employed instead. Because the projected population rate changes in the CEEC10 tend to become more negative over time and their populations are larger in the earlier years of the projections, taking the average value of these changes

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results in lower overall population estimates (roughly one percent less in the systems model compared to the statistical model in 2030 when checked using data from Bulgaria; complete figures are available upon request). Although this difference is a small one, it must be kept in mind when comparing the results of the two population change forecasts. This methodological distinction also makes it necessary to run “no population change” models during the alternative modeling phase of the project to determine exactly how influential this difference is. Finally, this analysis remains aware of the other caveats of utilizing these World Bank population projection data described earlier.

<sup>56</sup> The migration rate calculation equation (using the one for Bulgaria as an example) is as follows:  
$$(0.00595407870156363 * \text{per\_capita\_Bulg\_mig\_stk}) + (0.000100377268106815 * \text{LOGN}(\text{Bulgaria\_GDP\_Ratio})) + (-0.000965588821154321 * \text{LOGN}(\text{Bulgaria\_Employment})) + (0.00100030142107599 * \text{LOGN}(\text{Germany\_Employment})) + (0.0000131907879702328 * \text{free\_migration\_policy?}) + (\text{ROR\_av\_Bulg\_ed\_level\_Bulg\_mig\_rate}/10000) + (\text{ROR\_Bulg\_20\_to\_34\_pop\_Bulg\_mig\_rate}/10000).$$

The coefficients for the first several equation elements are the long-term coefficients taken from the GLS statistical model that excludes the country-specific variables. Please see several previous endnotes and the text for descriptions of the other parts to this equation.

<sup>57</sup> An interesting comment can be made after closely examining the first part of Figure 4.2 (the section labeled “Bulgarian Basics”). It might seem at first that there should be a thick flow arrow between the population and migrant stock reservoirs rather than a thin connector arrow between the population stock and yearly net migrants flow because Bulgarian citizens are moving out of the country to take up positions as worker migrants in Germany. However, that action would effectively remove these migrants from the population stock. Both the statistical (where appropriate) and systems models assume that the only way that a CEE country’s citizens can leave the population is through the population change variable (i.e., death or some other permanent removal from these figures). While it is true that some EU worker migrants eventually become citizens of the country where they take up jobs, relatively few of them take that action and only after a considerable delay after moving away from home. Having yearly flows of workers and assuming that they all become citizens of Germany upon moving, which is what having a flow arrow between the two reservoirs would imply, is therefore inappropriate. The few people who do change their citizenship can be accounted for in the systems model by using the population change converter (which takes projected future permanent emigration into account) that adds or subtracts individuals from the sender-country’s population. Effectively, this strategy avoids double-counting the citizens who permanently leave and prevents an overestimation of how many new citizens the host country could expect to receive from Central and Eastern Europe.

<sup>58</sup> The user interface is also left out of the present figure. That action is taken because it consists only of tables and numeric displays designed to maximize available information to the author and could thus be considered rather user-unfriendly. If this model is ever to be utilized by the public in some future iteration, a new interface containing more user-friendly tools like knobs, sliders and graphs must be created (Richmond, 116-120; Sterman 2000, 898).

<sup>59</sup> Please note that the data sources and variable specifications for the various parts of the baseline systems model are available in the relevant parts of Chapters 3 and 4.

<sup>60</sup> This date is chosen as the initial year for this investigation because, as is discussed in the statistical modeling chapter, it is the first year that reliable unemployment data are available for all of the CEEC10 new member states.

<sup>61</sup> A potential version of this systems model may someday employ data from all twenty-two countries utilized in the statistical model as a check on this systems model for post-CEEC8 accession migration from these twenty-two sender countries, but that test remains to be performed. In other words, the question here would be how well the model continues to track migration in its post-2003 “future”.

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<sup>62</sup> One unavoidable exception to this timing rule concerns the education level data. As indicated earlier, these data are only available sporadically from the various national statistical offices and have only been collected by UNESCO in recent years. These facts imply that the circa-2003 education level data must be employed in this systems model test despite the issues that this act introduces. Even though national average education levels change quite slowly, it would have been better to employ data closer to 1996, but that option is foreclosed here. On the other hand, because the proportion of college migrants from each sender country does not affect the migration rate calculations, any problems with having these data programmed into the model are completely avoided.

<sup>63</sup> Again, every sender country is missing at least one entry in the twenty to thirty-four year old population time series between 1996 and 2003. Some countries are missing more points than others, but every new CEE member state has at least one gap. However, every country has an entry for 1996 (except Slovakia, where the 1999 entry must be used instead) and 2003 (except Slovakia and Latvia, where their 2002 data must be adopted), which allows this research to utilize the overall average change rather than the average of the annual changes for this converter.

<sup>64</sup> It should be kept in mind here that the purpose of all of the models in this analysis is to predict worker migration from a group of countries to Germany (and eventually to the EU15), so the presence of discrepancies in individual country estimates does not pose an issue for these models. The statistical models use data from twenty-two countries to create estimators for migration predictions from ten countries (not just one), after all, and considerable portions of the systems models rely upon these statistical model results.

<sup>65</sup> The percentage of (working-age) college migrants in the migration flow is reported rather than the number of college migrants due to the reasons described in a previous endnote. The percentage of younger workers in that flow is presented in the relevant table because of uncertainties surrounding the operationalization of the age disproportionate factor converter. (Additionally, an initial division by zero problem in the systems model requires one to calculate the overall percentages of young worker migrants separately.) Again, while it is helpful to be able to assert something in this analysis about the composition of the projected CEE10-EU15 worker movement, one cannot overstate the case here by reporting exact numbers of these workers in the relevant migration stream.

<sup>66</sup> More information and figures from these tests, along with the experiments concerning this model's assumptions, are available upon request.

<sup>67</sup> The systems modeling software can be programmed to forbid negative values in stocks and thus prevent ridiculous outcomes like a negative young worker population. However, it cannot be instructed to place a maximum limit on some stock, an observation that is important later in this discussion. It is also interesting that these problems arise in the two "descriptive" reservoirs rather than any of the substantive stocks, which is a theme that is evident in later discussion as well.

<sup>68</sup> It should also be noted that the percent college migrants reservoirs become completely or almost completely depleted by the end of this experiment, but that consequence is not overly important given that this variable plays no role in calculating the migration rate for each sender country.

<sup>69</sup> One might even be tempted to interpret that observation as an indication of just how difficult it is to impel many workers to leave home for job opportunities elsewhere.

<sup>70</sup> Please keep in mind that the age disproportionate factor is not tested in this section because it does not have any impact on the migration rate calculations. (This assertion is also the reason why the percent college migrants stock is not discussed very much in this section of the chapter either.) However, if one were examining the actual numbers of young worker migrants here, the disproportion factor would need to be adjusted so as to not create figures that exceed the total number of migrants in the relevant flow.

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<sup>71</sup> This statement can be made because most soldiers belong to this age group. In fact, the infamous demographic situation facing France after World War I (Zolberg 1983, 242) is the inspiration for this label.

<sup>72</sup> Although the elderly and children are sometimes more susceptible to the effects of natural disasters, that difference is not great enough to treat those groups disparately in this variable test.

<sup>73</sup> Please see an earlier endnote for details about what graphical functions are and how they operate.

<sup>74</sup> It should be observed here that neither of the assumptions that deal with college migrants proportion change are discussed in this section because the college migrants stock does not affect the calculation of any sender-country's migration rate. However, an interesting point regarding the sender-country GDP change-college migrants change assumption experiment is that the boost to this rate of change depletes every country's college migrant population by the end of the test run. Obviously, this outcome is unrealistic; if this variable had an effect on the migration rate, one would even assert that this result might expose an unhealthy dependence on this assumption. However, it only reveals a limitation in this model that is taken up in somewhat more detail in the discussion portion of this chapter. Additionally, the age disproportionate converter test is not explored here because the underlying assumption in that relationship also has no impact on the migration rate calculation.

<sup>75</sup> Those two earlier endnotes describe how each forecast year's GDP ratio is calculated and how population changes are handled differently in the systems and statistical models. One of the overarching reasons why the no population change models are so prominently featured in the text of this chapter is to demonstrate that the observed migrant numbers decline is not only attributable to the alteration in the operationalization of population change, in fact. An interesting observation about the migration rates in the statistical and systems models is that six out of the ten CEEC10 migration rates in the former are increasing by the end of the run while that is true for only two (Bulgaria and Romania) of the ten countries in the latter.

<sup>76</sup> The reinforcing loop  $R_2$  in the causal loop diagram graphically illustrates the implications of what is described in these past few sentences.

<sup>77</sup> This paragraph treats "net migration rate" (Figure 4.2) and "number net CEEC worker migrants" (Figure 4.1) as equivalent for the purposes of this exposition. Although this decision represents a bit of an elision and these are two distinct ideas that should normally be kept separate, it is convenient for the moment to treat them as interchangeable ideas here.

<sup>78</sup> One might object here that the per capita migrant stock-donor employment change assumption test shows that a tenfold increase in the effect of the migrant stock variable on employment change generates a negative influence on the migration rate. However, this argument begins from the imposition of a negative alteration on per capita migrant stock, which should eventually create a positive change in migration rate. In other words, these two observations are consistent with one another, although one would need to spell them out explicitly to see why. On another note, more information on the annual migrant flow data of the baseline systems and population-adjusted statistical models is available upon request.

<sup>79</sup> Theoretically, any of the stocks could decay to zero if the experimental conditions were set harshly enough, but none of the other stocks seem to suffer from this threat under reasonable testing conditions. Even the two that collapse to zero more than once only do so under fairly trying conditions. One could make a corresponding statement about the remainder of the stocks "exploding" to ridiculously high values, except for the German employment stock. That variable is a concern for the same reasons that drive the present discomfort about the sender-country employment stocks, even if during its own GDP change assumption test German employment does not approach the one-hundred percent limit particularly closely.

<sup>80</sup> This technique would not be applicable to the young worker variable because it is only reduced by the projected average rate of this population segment's decline (see Figure 4.2 for confirmation).

## Chapter 5: Conclusion

At the end of any lengthy research project such as the present one, it is valuable to spend some time evaluating the contributions that it makes to the field and to reflect upon the future course that the analysis could take. Therefore, the goals of this chapter are to succinctly review the results of this work (including the policy implications of its outcomes), appreciate the places where the work could be strengthened, and forecast how it might develop in the future. This section of the project addresses these ambitions by first discussing the particular outcomes of the statistical and systems models in detail and linking them to the general migration literature. This discussion also endeavors to fit the results of the current study into the pattern created by previous examinations of CEEC10 post-accession migration. A description of the policy repercussions that these results could have for the EU, especially for how the organization and its member states should deal with the issues generated by future accession rounds, follows this part of the discussion. Finally, a brief analysis of how the statistical and systems models' outcomes may illuminate interesting political features of the EU, along with the future directions that this research might take in terms of subject matter, model construction, and methodology, are explicated in great detail. There remains much to be investigated about the politics of CEE migration within the EU, especially as the latter continues to accept new member states from this region.

### **Results Overview:**

Since the results of the statistical model form much of the basis for the conclusions that this analysis can reach, it is appropriate to elucidate what is discovered using this model first. Perhaps the most critical observation one can make about these results is that a

variety of economic, demographic, political and policy influences all help to significantly determine the rate at which migrants arrive in Germany over the forty four-year period (1960-2003) of the statistical model's analysis. As asserted by various versions of the neo-classical economic<sup>1</sup> theory of migration, disparities in GDP between countries and the employment levels in both the host and receiver states have important effects on the net migration rate between them. Although the relationship between the lagged GDP ratio variable and migration rate is distorted by the presence of the country-specific dummies and several dichotomous policy variables in at least some versions of the statistical model, the model's economic variables<sup>2</sup> tend to be consistent and significant predictors of the migration rate over most of the statistical model's variants. However, the same claim cannot be made for the migrant stock variable, which network theory<sup>3</sup> states should be a significantly positive determinant of migration rate but Fertig (2001, 714) discovers is a significantly negative predictor of this quantity. The difficulty in the present analysis is that in many of the model's variations per capita migrant stock also interacts with the country-specific variables. Initially, it appears as though Fertig's assertion that the presence of same-country migrants in a receiver economy makes it more difficult<sup>4</sup> for later such worker migrants to find jobs there. However, once the influence of the country-specific dummies<sup>5</sup> is removed, per capita migrant stock possesses network theory's predicted positive relationship with migration rate (albeit insignificantly). In short, little can be conclusively stated about the influence of migrant stock on migration rate, even if the weight of the literature's evidence behind network theory leads to the use of this positive coefficient in both sets of projections and the systems model's construction.

As stated earlier, certain political, policy and demographic variables also significantly determine migration rate magnitude. For instance, guest worker programs have a considerably positive impact on migration rates because the receiver governments are actively encouraging particular countries' workers to labor in their economies. The reverse logic explains why migrant repatriation programs have a significantly negative effect on the dependent variable. The observed significance and direction of both of these relationships would have been expected according to neo-classical economic theories of migration that argue that the magnitude of certain obstacles to worker movement can be expressed in migration utility equations as part of a constant term. The relative level of national development, a measure of national economic, educational and medical care achievement (United Nations 2008, 355), also has a strongly negative impact on migration because the benefits to workers of moving in cases of similar development levels between economies are small. The existence of a language similarity between the sender and receiver country, another demographic characteristic, is a positive determinant of migration rate because that feature of the two relevant countries removes an important barrier to worker migrant employment. Civil wars also tend to drive migrants out of their home countries for receiver ones, even if the broader measure of political instability initially utilized in this study is not a good predictor of interstate migration. In fact, not every political and policy variable<sup>6</sup> is a significant determinant of the dependent variable in the theoretically expected direction. The existence of an authoritarian government in a donor country, for instance, is not a statistically substantial reason for that state's workers to move to a democratic one. The presence of a global city in a sender country, which according to world systems theory<sup>7</sup> should attract internal migrants and thus depress

interstate migration, also has no significant impact on the migration rate (although that influence is in the theoretically expected direction). Most surprisingly for this analysis, however, is the observation that the free worker movement dummy is not a significant predictor of migration rate even though some major studies cited earlier (Boeri and Brücker 2000; Fertig) find that it is. Even though this variable is brought forward into the systems and statistical models' projection phases for theoretical reasons, this lack of a significant relationship with the dependent variable has important implications for EU worker migration policymaking.

In order for this analysis to be able to proffer conclusions about this subject in regards to Central and Eastern Europe, it must also contain projections of the magnitude of this phenomenon over the course of the next several decades. It would prove to be very difficult to comment on or plan for this movement without some fairly reliable estimates of how many such workers (and their dependents) might be arriving in the EU15 member states during that time frame. In the end, the forecasts of CEEC10 worker migration based solely on the statistical model's results estimate that a modest net percentage (1.388%) of those countries' citizens will arrive in the EU15 economies by 2030. Although there is always considerable uncertainty involved in extrapolation or projection of any sort, one could take some comfort in the experiment that demonstrates that the statistical model's estimators, when combined with the appropriate 2003 data, calculate a total migration result that is less than two percent higher than the actual number of CEEC10 net migrants who arrived in Germany that year. This model's prediction of a moderate influx of CEEC10 workers is also robust under a number of different realistic alternative economic and policy scenarios. The projections from the systems models,

which are founded on the results of the statistical models, confirm that a modest number of post-accession CEEC10 workers should be expected to arrive in the EU15 member states given sensible expectations about the economic performance of both the host and donor countries. Even after the introduction of several new variables, relationships, and loops in the systems model compared to the statistical one, even fewer workers would be expected to arrive in the receiver economies. In fact, it seems as though the addition of these new entities may have improved the accuracy of the overall model; the 2003 point estimate is now under one percent away from the observed net CEEC10 migration total in Germany, and the seven-year (1997-2003) total is only two percent above what is recorded for that period. The calculation of the alternative assumptions projections for the systems model reinforces one's beliefs about it, as the model grants reasonable projections under several realistic sets of economic and policy conditions.

The question then arises concerning what these projection results imply for the literature on post-accession CEE worker migration to the older EU states. A wide variety of projections of CEE worker movement appears in the policymaking and academic literature written in the decade or so before CEEC8 accession in 2004. These forecasts adopt numerous differing methodologies, evidence sources and time horizons, but a liberal synthesis of these studies could assert that the general consensus of this research is that in the long term around two to four percent of the CEEC10 population at the time of their accession would move to the older member states. Some investigations produce smaller percentages than this consensus and others (including many of those that received the most public attention) report larger percentages, of course, but the majority of the best projection estimates lie within the two to four percent range. The realization of such an

influx over that time span would present political and economic challenges for both the receiver and sender countries, but they would be manageable using normal state resources. The fact that the present research determines that a somewhat smaller number than this consensus figure of worker migrants could have been expected based on a different methodology and data set than the previous studies utilize suggests even more strongly than the consensus figure does that the higher numbers reported in this literature may be unrealistic and unlikely to be observed. It also implies that perhaps some of the higher consensus figures (Krieger, 16-18) could be improbable as well. Furthermore, the low figures generated by both the statistical and systems models in the present research intimate that CEEC10 net worker migration to the EU15 countries will not be as disruptive to either the sender or receiver economies as one might expect<sup>8</sup> from the consensus figures. This observation provides at least some of the background for a few of the matters that are discussed in the next section.

#### **EU Policymaking Implications:**

One of the original loci of this research effort is to investigate and describe various public policies that the EU and its member states could adopt to affect the magnitude and characteristics of intra-EU worker migrants. Therefore, a detailed discussion of how the results of this study could inform the EU worker migration policymaking environment is appropriate for this concluding chapter. First, it is critical to note that the statistical model demonstrates that EU supranational and member-state politicians can devise policies<sup>9</sup> that have the ability to affect the net migration flow for receiver countries despite intimations to the contrary (e.g., European Commission 2006, 14). Both guest-worker and migrant repatriation policies<sup>10</sup> have significant effects on the net migration rate in the theoretically

expected directions in the modified basic model. However, neither of these policies is available to politicians when dealing with concerns surrounding intra-EU migration.

Member-state government policies must treat all other EU countries' citizens equally, and nothing can be done to hinder their acceptance of work in any other member state, so an intra-EU guest worker program or return migration project<sup>11</sup> would fall afoul of these rules.

By contrast, the one policy option that is temporarily available to older member states that want to control worker migration from accession countries, delaying their application of the EU's free migration policy to the new member-states' workers, does not garner much support from the statistical model. Although the implementation of this policy does have a positive effect on the observed migration rate (and thus delaying that implementation would slow it down), this variable is not statistically significant in almost all versions of the model. Both the statistical and systems model-based forecasts also demonstrate that the timing of when (or whether) this policy is put into practice by the receiver country has a very limited impact on the overall number of projected worker migrants who change economies. Additionally, the strongly bounded post-accession evidence of greater economic growth by member states that allowed free migration from the first moments of CEEC8 accession would tend to mitigate against adopting a policy of free worker movement postponement. On the other hand, proponents of embracing that delay would point to the post-2004 "deflection effect" as evidence that older EU member states can control whether accession-country workers arrive in their economies and that perhaps they should take advantage of that derogation if their governments believe that their constituents' jobs would be threatened by new member-state workers. However,

neither the EU nor its member states are likely to want to encourage the sort of “beggar-thy-neighbor” attitude inherent in promoting such a policy option, especially when the organization was founded to promote comity between European nations.

The matter of what the EU and its member states might choose to do given the evidence in the present worker migration investigation as it continues to admit countries from poorer parts of Eastern Europe should now be addressed. Exploiting the policy learning process is a vital part of improving any institution’s efficacy, and the EU is no exception to that rule if it wants to accomplish its most important objectives. For many decades, one of those goals has been to foster a Europe-wide single market in labor as well as for the other factors of production, and many EU programs have been designed to develop and strengthen that market and the workers within it. However, the outcomes of this research seem to indicate that there will not be large post-accession movements of workers within the expanded EU even though there are (and will likely continue to be) considerable economic disparities between different EU regions. This observation implies that if the EU really wants to cultivate the intensification of a continent-wide labor market, it must continue to sponsor programs like EURES and LINGUA that assist in that growth. Even though they are designed for use in all EU countries, the expansion of programs like them in the new CEE member states would probably broaden and deepen the single labor market by improving the knowledge and skills of that region’s workers. Another step in that direction might be to eliminate or at least drastically curtail the application of the free movement derogation in future accession treaties. Virtually none of the statistical models developed in this study demonstrate that its presence is a significant predictor of migration rate, and the forecasts derived from the statistical and

systems models do not seem to indicate that the introduction and maintenance of this policy has much effect on the magnitude of projected CEE worker migration. Therefore, one could contend that the derogation should be eliminated given the hard feelings it engenders among the citizens and governments of new member states. As indicated earlier, the imposition of these limits on only the less-affluent candidate countries can make their workers feel like “second-class citizens” of the EU, an outcome that the EU as a whole should want to avoid.

However, these policy suggestions ignore some unyielding verities of EU state-level politics of the past two decades. Despite the weight of the evidence presented in most of the forecasts (and now in a few years of experience) of CEE worker movement to the EU15 countries, their publics’ and thus politicians’ concerns about a flood of cheaper CEE labor arriving in those economies remains high. While federalists (Reid, 45-46) and other EU supporters may desire to create a continental free market for labor, it is far from clear that some member-state politicians and their publics share that objective. Concerns about native workers’ job and wage losses from the expansion of competition represented by CEE accession might trump that goal even if it were a common ambition of all members of these groups. Any sincere suggestion about making labor competition more intense or accelerating its onset would likely be met with serious political resistance from some quarters. The issue can then be raised about what the EU and its member-state politicians could do to achieve this goal even in the face of such opposition<sup>12</sup>.

One potential lower-resistance path to this objective might be to continue the policy of allowing countries to adopt the derogation on free worker mobility in future accession rounds despite the limited evidence in support of its efficacy. That step could

permit member-state politicians to assert to their voters that they have done something concrete to protect their country's workers from "foreign" competition and give those workers a comforting sense that their jobs have been temporarily protected. While on the surface this strategy could seem like a good application of political psychology, on another level it seems disingenuous to sell a policy whose benefits are scanty at best to the public as a solid solution to the problem of increased post-enlargement labor competition. An improved solution to this conundrum might be for EU policymakers and member-state politicians to present an evidence-based case for the single labor market and plan to compensate and retrain older EU member-state workers who might be harmed by increased competition from accession-country workers. Even though most forecasts, including the present one, indicate that relatively few EU15 workers should worry about being harmed by EU expansion, some of them will be and there should be some policies in place to assist them. These programs to aid vulnerable EU15 workers would not even need to be anything new<sup>13</sup> since the EU's cohesion policy programs (Dinan 2005, 373-385) have been assisting workers in similar straits for many years. While this plan might be criticized using the argument that information access is not really the problem<sup>14</sup> here, it has the advantage of proposing practical strategies to address very real issues involved with European economic integration.

#### **Broader EU Political Implications:**

One could certainly contend that the results of this analysis could be mined for inferences that go beyond the strictly policymaking realm<sup>15</sup> of EU politics. Perhaps the most interesting such inference is what this research can illuminate about the dynamics of two-level games (Putnam 1988, 433-435) within the various EU political arenas. This analogy

is designed to help political scientists examine the political opportunities and constraints that national politicians encounter when engaging in international relations. More specifically, state-level politicians in democratic societies must simultaneously satisfy both domestic interest groups and voting blocs that control their chances of political survival and the other heads of state and government with whom they are bargaining during interstate negotiations. At times, the former may make it impossible for state politicians to complete international deals that would be advantageous for them, and the reverse may also be true occasionally. Conversely, fortuitous arrangements of domestic forces (and international relationships) may allow agreements to be finalized that would have been impossible under other circumstances. Two-level games are apparently quite common in the EU (Moravcsik, 3-7, as cited in Cini, 109-112); in fact, a clear-cut case of one can be spotted in the behavior of German Chancellor Angela Merkel during the Greek bailout crisis of 2010 (Kulich). At the same time that Chancellor Merkel felt extreme pressure from her Eurozone partners to not allow the Greek government's finances to wreck the common currency and thus to lead the charge for a bailout, she was tightly constrained by domestic electoral concerns and massive German popular disapproval for rescuing the "profligate" Greeks. These countervailing demands led, in the eyes of some observers, to dawdling on Merkel's part and an escalation of the size of the Greek debt crisis.

It could be argued that another two-level game exists in the way that the EU15 member-state politicians handled the free worker movement derogation for the CEEC10 (and for earlier accession countries as well). At the European level, these heads of government were supposedly committed by the Treaty of Rome to the ideal of

demolishing any remaining barriers to the free movement of all factors of production between that document's signatories. These politicians may even have been personally convinced of the rectitude of this policy by the economic or pacificatory justifications for it without the outside compulsion wrought by their treaty obligations. Additionally, bureaucrats within the European Commission, the body that negotiates accession treaties on behalf of the EU, were also strongly committed to this principle. However, virtually all of the domestic policymakers (especially the leaders of EU15 countries such as France, Germany and Austria) faced considerable to massive resistance to the notion of free labor mobility from the CEEC10 in the years immediately preceding their accession. It would have been politically difficult, or likely impossible, for these politicians to sell the CEEC10 accession treaties to their home legislatures and publics without the free labor derogation. These heads of government would have probably faced substantial retribution at the ballot box<sup>16</sup> during their next elections without its inclusion. In fact, it likely would have done these decision-makers little good, in defense of their electoral chances, to cite the results of the Commission's studies of CEEC10 migration potential (or that of the present research, if they had been available) that promised that a modest number of these countries' workers would move to the EU15 economies. The constraints created by these domestic pressures therefore impelled the EU15 governments to insist upon the free worker movement delay, despite the costs associated with this policy.

The detection of this two-level game holds at least two possible implications for the future of the European Union and the research agenda present in this endeavor. First, this perspective helps one to resolve a central puzzle for this analysis, the apparent divergence between what EU15 politicians stated publicly about the importance of

opening markets to the CEEC10 and their actions when it came to labor mobility. One might be tempted to ascribe insincere motives to these politicians, but that is not really what engendered this behavior. Rather, the different audiences that these politicians were forced to address, along with the conflicting incentives that they provided to these decision-makers, shaped how these politicians behaved when the worker mobility derogation was being negotiated. In short, this situation is not one of contradiction between soaring rhetoric<sup>17</sup> and grotty reality; in fact, it is actually one of healthy compromise and the “art of the possible” that is a normal part<sup>18</sup> of democratic politics.

Second, the perception of this two-level game in the politics of intra-EU labor migration may have implications for the future of the European Union<sup>19</sup>. A federalist may take a pessimistic view of the presence of a two-level game in this policy area because it implies that state-level concerns may always outweigh supranational ones for EU member-state politicians. It also indicates that these constraints may halt pro-single market policies from being enacted or fully implemented, even when they would be to the advantage of both the member states and the EU. A person who had this perspective might continue by asserting that if the German role in the 2010 Greek bailout is the expected outcome of these two-level games, then the EU may face a bleak future indeed (and not just in the area of free labor migration). However, a different observer of EU politics could examine this situation and conclude that the prospects of the organization are actually fairly good. If two-level games are as ubiquitous and inevitable as they seem to be and the EU has managed thus far to muddle through to its present status as a guarantor of peace and economic prosperity throughout Europe, then perhaps it will continue to resolve these matters in ways that will benefit its member-state citizens.

### **Future Research Directions and Conclusion:**

Despite the fact that many features of the politics and magnitudes of past, present and future CEEC10-EU15 migration are elucidated fairly thoroughly in this analysis, there remains much to be done in this area and with these models. For instance, even though its results are reasonably good when calculating 2003 migration, the baseline statistical model<sup>20</sup> could probably be improved by expanding the number of countries in the data set. At least one country with a full collection of net migration data to Germany from 1960 to 2003 is left out of the set because its migration numbers are so miniscule (Iceland), and several others are omitted because they have almost, but not quite full, time series available (e.g., South Korea, Mexico). An interesting experiment with this data set<sup>21</sup> would be to see how, if at all significantly, the results of the statistical model would be altered by the inclusion of these initially excluded economies. Due to the balanced panel requirement of the statistical technique utilized in this analysis (Baltagi 2009, 99, 187), the addition of the second type of country would need to be accompanied by an alteration of the time frame under investigation. Aside from changing the list of sender countries in the data series and exploring whether the present outcomes are overly dependent on the choice of donors, this alteration could be justified by investigating the interpolation assumption that is necessary to have migrant stock data available back to 1961. In other words, eliminating the 1961 to 1966 migrant stock data interpolation might have an impact on the results, and it would be reasonable to investigate that possibility with and without an expansion of the available sender countries. Another potential way of modifying the time period of this research would be to drop the pretense adopted in this study of investigating the net worker migration magnitude that could have been expected

at the time of CEEC8 accession and examining what current politicians could expect from this part of the EU from now until 2030. That action<sup>22</sup> would allow data from a few more years to be available to this investigation and perhaps make this study of more interest to a wider audience. It may also permit this project to take into account the post-accession “deflection effects” that altered the CEEC10-EU15 migration patterns, especially since Eurostat has been collecting internal worker migrant distribution information for the past several years (Herm, Vasileva).

Adding data to the statistical model to update it to the present day would be a necessary step for the next (and possibly the most important) potential extension of this research. Now that CEEC10 enlargement is an accomplished reality, the EU and its member-state policymakers are interested in understanding the implications of the next round of CEE accessions that are tentatively scheduled to occur during the 2010s. The three official CEE candidate countries (Croatia, Macedonia and Turkey), as well as most of the potential member states<sup>23</sup> that have filed accession applications but have not yet been accepted as official candidates, are considerably poorer than the member states that joined in 2004 and 2007. If EU15 public concerns about Poland and Romania joining the organization were elevated given these new member-states’ economic circumstances, those anxieties are almost certain to be even higher over the potential membership of the applicant countries, especially Turkey given its population size and relative impoverishment. Any systematic study that can provide an estimation of the worker migration magnitude that the EU15 countries might experience from expanded CEE membership would likely be appreciated in both the academic and policymaking communities. In fact, this extension could be taken even further by applying the

forecasting model to CEE countries that have not applied for EU membership yet but might do so in the future (e.g., Ukraine, Belarus). Even though their EU membership might be a distant prospect given their current economic and political troubles, EU policymakers and publics are probably concerned about the level of migration that they might expect from these countries and want to know more about this prospect.

Two comparatively minor potential future alterations to the statistical model remain to be elucidated in this section. The first change concerns the use of Germany as the host country for worker migrants and the base from which movement to the entire EU is calculated. As stated in the explication of the statistical model, Germany is utilized as the migration target country in almost all studies of post-accession migration potential because the country's data are the most comprehensive. However, other member states and the EU itself have been improving their migration statistics in recent years, so it might be worthwhile in future iterations of this research agenda to revisit the question of whether German data<sup>24</sup> must be used in constructing these models. That development might allow other member states or the EU as a whole to act as the base country, which may alter the worker migration magnitudes forecast by such models, especially when combined with updated information on migrant geographical distribution. Another possibly useful shift of the model's methodology would be to permit the two-percent economic convergence assumption to vary by sender country. A step in this direction is taken by the systems model as it allows the education level graphical function to affect this value, of course, but one could argue that other factors should impact this figure as well. These additional variables (e.g., level of development, inertia) could be accounted for by using the average value of each donor-country's convergence rate over a certain

number of years rather than assigning a blanket two-percent projected rate to each new member state. Although this act might make the model's construction a bit more complex, it could be worthwhile in that it may provide a somewhat more realistic view of how economic convergence between the host and sender countries occurs.

*Systems Model Changes*--Since systems models have a different construction from statistical models, there are certain features that can be added to or changed in the former that cannot be altered in the latter. As implied in the conclusion of the systems modeling chapter, the present baseline model is of relatively minimal complexity because this research is trying to maximize its leverage (King et. al., 29-31) over the CEEC10-EU15 migration system. Parsimony is not an overarching goal here, but in general simpler models with fewer variables that explain more of the features of any particular system are better than complicated models with many variables that explain relatively little about the system in question. However, the goal of expanding leverage as far as possible cannot be allowed to block progress in understanding more features of the relevant migration system. Therefore, this discussion explicates the most to least-extensive modifications to the baseline systems model that are under consideration for future iterations of this research. The most considerable potential change is one that has already been discussed: creating a systems model that tracks gross rather than<sup>25</sup> net migration. As indicated earlier, the dynamics, politics and policymaking of gross migration could be quite different from that of net migration because small-scale net migration could be the result of either large or small two-way gross migration. These two possibilities could have quite different effects on both the receiver and sender-country's economic and political systems. Thus, the CEEC10-EU15 gross migration system should be examined carefully

in a future analysis to determine which reason is present for the relatively small net migration observed in this study. Gross migration data to and from Germany are available from the *Statistisches Bundesamt*, so all that would be required here is the time and thought necessary to construct new models from first principles.

The next hypothetical addition to the baseline systems model involves explicitly endogenizing two features that are currently treated as exogenous. In other words, the modified systems model would calculate certain values that are basically treated as givens in the original version of the systems model. Specifically, the sender-country age<sup>26</sup> and educational advancement structures would be included explicitly in the updated systems model as “aging chains” (Sterman 2000, 469-472). A purpose of these chains is to grant the modeler a better understanding of the dynamics of the system under study if considerable delays and leaks are expected within its growth structures. Their inclusion here should permit the calculation of the average values of these stocks within the model and allow for the investigation of how different policies might affect these worker migration determinants. For instance, chains for skills development, educational acquisition and aging are employed in the Indiana workforce analysis cited earlier (Bickers); that action allows users of this model an opportunity to create different public spending mixes that could maximize employment opportunities for Indiana workers or accomplish other important policy goals. They are not utilized in this version of the CEEC10-EU15 worker migration systems model because their implementation can be problematic due to their complexity, but a future iteration of this model may be able to take advantage of the opportunities these chains provide. Another possible expansion of this model would involve dividing the implicit receiver-country labor market into high

and low-skill sectors and then examining the kinds of workers who are attracted to that economy. In other words, one could investigate how high the skill and education levels of the CEEC10 workers who arrive in the host country are and whether that receiver country can enact policies that appeal to certain kinds of worker migrants over others. Once again, the inspiration for this change is the Indiana workforce model that is predominantly concerned with what businesses and politicians can do to attract and keep high-skilled workers and jobs in that state. This notion could have been added to the present version of the systems model, but is not included due to a decision to keep the model as simple as possible. However, a future rendering of this model could certainly include it if this research evolves sufficiently in that direction.

An elucidation of three less-complicated modifications to the systems model remains to be completed to finish this section of the conclusion. The first of these revisions would be to include gender in the model, either as a descriptive characteristic of the worker migrant population (like the college migrants percentage stock is) or as part of the migration rate calculation. It is widely acknowledged that economic migration, especially in the earlier periods of a migration system's creation, tends to be a young male's pursuit (Hatton and Williamson, 10-11; Massey et. al. 1998, 47-49), and there is at least some early evidence from the post-accession experiences of the UK as a host country that this statement is holding true in the CEEC10-EU15 migration system (Pollard et. al., 25). However, as the migration system and the networks that sustain it mature, the migration flow's composition becomes more representative of the donor economy as a whole (Massey et. al. 1998, 50). More research is necessary to determine whether this variable should be included in the systems model and the way in which it

should be incorporated (if at all), but once this inquiry is completed gender may prove to be a useful addition to this investigation. One particular change in methodological assumption that could be made here would be to create a revised graphical function between migrant stock and the migration rate. Instead of having a perfectly linear positive relationship involving these two variables (i.e., as the migrant stock grows, so does the migration rate using the coefficient derived from the statistical model), one could assert that the networking effects of the migrant stock do not operate until after a certain percentage threshold is surpassed. In other words, the network must reach a “critical mass” before it can provide support services to later migrants in sufficient amounts to affect the migration rate; just having a few fellow citizens (likely with scanty resources of their own) in the host country would not be enough to generate those network effects. An alternative formulation of this same idea might assert that this influence would be smaller at lower migrant stock levels but would eventually reach its full force after some threshold is reached. Considerable examination of these formulations remains to be undertaken if either is to be incorporated into the model, but at first glance this idea appears to have at least some merit. The final model revision that should be mentioned in this section consists of the set of variable, relationship, and operationalization changes that may be necessary to prevent particular stocks in model (e.g., sender and receiver-country employment) from taking on impossible values. Although many of the variants of these alterations are discussed in detail at the end of the systems modeling chapter, they deserve to be referenced here as well because they represent relatively uncomplicated potential future changes to the baseline systems model.

*New Policy Studies and Overall Conclusion*--Generating migration forecasts of CEEC10 workers to the EU15 countries so the latter member-states' decision-makers can create appropriate admissions policies is only the first potential application for this research's outcomes. Perhaps the clearest potential use of it would be to expand its scope so that it can judiciously comment on the question of what governments can do to encourage the "right" migrants to move to their economies. In other words, the puzzle here is what policies politicians can put in place to attract the workers that their economies need to prosper in the future. For the most part, EU15 economies require highly skilled and educated worker migrants<sup>27</sup> to fill jobs in advanced service-oriented positions that cannot be filled by domestic workers. This problem is likely to become more acute over time as the populations of the EU15 countries continue to age and shrink over the next several decades (Coleman 2002, 49-57) even though continued GDP growth is necessary to support that more-elderly population. The Indiana workforce development systems model described previously attempts to address that question through different mixtures of economic development, traditional education, and adult skills-acquisition funding. It might be possible to further develop the systems and statistical models explicated in this analysis to address this policy question, but quite a bit more work on them would be necessary so that these models could take on that task. This analysis demonstrates that politicians can, under certain circumstances, affect the magnitude of the worker migration that their countries experience; it would be interesting to resolve whether they can impact their flows' skills composition as well.

Another readily apparent extension of the policy research in this analysis would be to expand the ambit of the brief welfare tourism case study explicated in the

discussion portion of the statistical modeling chapter. This investigation focuses on the UK-Poland worker migration relationship and makes a few comments about the absence of evidence for social tourism in the UK and elsewhere in the EU15 countries, but does not assert much more than that on this topic. Expanding the number of countries in the case study would be a relatively straightforward way to augment its coverage, as would a more in-depth qualitative examination of the CEEC10 worker migrants themselves and their reasons for moving to the EU15 economies. Given the concern that seems to exist in Europe about welfare tourism, there is certainly enough interest to warrant an article-length treatment on it in the future. A final policymaking issue that could be addressed by a future version of this research refers back to an implication that is suggested in the introductory chapter of this work. Although it appears that most mainstream European politicians accept the reality of European free worker movement, a considerable portion of their constituents do not and are trying to take a political stand against this issue. The concern that follows this observation is what these mainstream politicians should do to persuade their reluctant voters to acknowledge this new state of affairs and perhaps accept it substantively and psychologically. One answer to this query might be that they should do nothing but accept the voters' disquiet and repeal the laws and treaty provisions<sup>28</sup> that guarantee free worker movement, but that option does not seem realistic and would probably do more long-term harm than good to their constituents. Although this conclusion may derive from the elite-mass opinion divide that separates these sides on issues of European integration and may be another manifestation of the democratic deficit issue, it does seem that European policymakers at the member-state and EU levels must do something to address this problem. Increased spending on cohesion and regional

policy, including programs that prepare all EU workers to take advantage of the opportunities presented by the expanded single market, might help, as could amplified hortatory appeals on the part of EU politicians in favor of free worker migration. However, a detailed examination of how well these programs and appeals have worked in the past would be necessary before any such recommendation could be made, thus providing at least two more interesting courses into which this analysis could branch.

In conclusion, a considerable amount of work remains to be done on this research agenda and it could move in several exciting directions depending upon the outcomes of forthcoming investigations in this area. This analysis makes substantial strides in the correct direction, but once again there is much more to accomplish on this subject. However, one issue described in the introductory chapter remains to be elucidated here: the question of whether this research does anything to make the politics of worker migration a more conventional topic in the discipline. The answer to this question should likely be a qualified yes; while this analysis determines that certain public policies can impact the magnitude of intra-EU worker migration, it does not contain many suggestions for what future EU or member-state policymakers could do to affect the size or compositions of these flows. Again, some of the most effective policy tools for accomplishing this goal will not be available to EU decision-makers in the future, and it is unclear what should replace them. Future research may be able to shed some light on this question, and hopefully many more investigators will soon be interested in addressing this matter.

Table 5.1: Comparative Information on Various CEEC10 Migration Forecasts

Author(s)	Target Area	Estimated Migration Flow
Ortsey (statistical model)	EU15	1.4 percent in 2004-2030
Ortsey (systems model)	EU15	1.3 percent in 2004-2030
Alvarez-Plata et. al. (2003)	EU15	3.6 percent in 2004-2030
Boeri and Brücker (2000)	EU15	4 percent in 2002-2030
Brücker (2001)	Germany	2-3 percent in 2002-2030
Fertig (2001)	Germany	≈1 percent over 20 years
Hille and Straubhaar (2001)	EU15	0.2-0.4 percent per year
Orłowski et. al. (2001)	Austria	187 to 302 thousand over 10-12 years
Zaiceva (2006)	EU15	3-5 percent over 10 years

Note: unlike Table 2.1, this graphic only includes studies where the CEEC10 comprise the sender countries and (with the exception of the Zaiceva piece) the research in question uses a strictly econometric approach. This tactic is utilized in order to make the results of these investigations as comparable as possible; additionally, the baseline model's results for each author's forecasts is listed here rather than any of their alternative projections for the same reason. Please see Table 2.1 for a more complete list of past studies of CEEC10 labor migration.

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<sup>1</sup> Since macro-level neo-classical economic models of migration often contemplate labor shortages in receiver countries as pull factors for worker movement, one might hope to test the relevant hypothesis related to this concept and theory using the main statistical model described in Chapter 3. However, as can be seen there, the absorption capacity variables are so collinear with the employment variables that they camouflage the expected effects between the latter variables and change in net migration. Perhaps a revised version of this research might be able to construct a better operationalization for absorption capacity (labor shortages) that can avoid this difficulty.

<sup>2</sup> Unfortunately, no variables associated with the new economics of migration theory could be incorporated into the statistical or systems models as that action would likely require their complete restructuring to accommodate the assumptions of this theory. However, a future iteration of the systems model using the family unit as its base might be assembled to explore the utility of this theoretical framework.

<sup>3</sup> Although the institutional and cumulative causation migration theories are briefly summarized by this analysis' literature review, neither one of these notions provides the theoretical basis for any of the variables included in the models. Still, it should be noted that cumulative causation theory implicitly contains some positive feedback loops (e.g., the arrival of skilled migrants in a receiver area encourages later such migrants to settle in that same region) that could be investigated using systems modeling.

<sup>4</sup> This reversal of network theory that one might be willing to term the "saturation hypothesis" is deserving of further study because it seems to refute the reasonable contention of network theory that social capital and intra-migrant group relationships should make it easier for same-group migrants to make the transition to the receiver economies. On the other hand, common sense would dictate that an influx of too many worker migrants to an area with too few jobs would make it more difficult for later arrivals to find work. Hopefully, a modified rendering of the absorption capacity variable or something quite similar to it would allow a future analysis to clarify this matter more conclusively.

<sup>5</sup> By contrast, the political and policy dichotomous variables do not seem to interact very much with the country-specific ones as the former tend to keep their significance and relationship direction with the dependent variable regardless of whether the latter are included in the model (numbers omitted, but available upon request).

<sup>6</sup> In addition to these subsequent policy and political variables, the two gravity model-inspired regressors (distance and border) are also insignificant predictors of migration rate. It should also be noted that although this model does not test for the potential of democratic donor-country migrants moving to authoritarian receiver countries, one would expect that relationship to be negative or non-existent.

<sup>7</sup> Another theory described in the literature review that does not receive any attention from the current research's models is dual labor market theory. Since dual labor market theory is concerned with the types of jobs that migrants take in their receiver economies, one implication of any discussion of splitting the relevant portions of a revised systems model to explicitly deal with the skills and education required for certain positions is that dual labor market theory might be incorporated into that analysis. This argument should be kept in mind while perusing the systems model future improvements section of this chapter.

<sup>8</sup> At the end of this chapter, Table 5.1 lists several important previous forecasts of CEEC10 net migration from the literature review along with the outcomes derived from this analysis in order to locate the latter in the pattern created by previous investigations of this question.

<sup>9</sup> One topic that sometimes arises when discussing policymaking, especially in a situation such as the one surrounding CEEC10 migration potential forecasts where it appears that politicians systematically discounted the guidance that their advisors provided them, involves the use of expert analysis by politicians. This issue is especially contentious when these instances involve the utilization of natural science research, such as in the disagreements surrounding climate change policy, the epidemiological links

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between environmental chemical exposure and cancer, the dangers of secondhand smoke, and the safety of dietary supplements. Unfortunately, there is at least some evidence (Mooney and Kirshenbaum, 57-60) that suggests that policymakers are liable in these situations to “cherry-pick” the information that supports their predetermined conclusions rather than weigh all of the best-available data and make decisions based on the relevant facts. If this contention is correct when it comes to evidence derived from the natural sciences, it is unlikely to be any different when it comes to social scientific evidence. However, both social and natural scientists have the same professional and ethical responsibility to pursue factual knowledge using the best methodologies and practices that they know regardless of how (if at all) it might be used by politicians and other policymakers. As this author was told in his first semester of studying public policy, all you can do as an analyst is the best job possible; what happens to your report, along with its data and conclusions, after it is released to the client is out of your hands.

<sup>10</sup> It should probably be mentioned at this point that, according to the statistical model, the existence of an intrastate war can also significantly impel more migrants from one place to another. However, it is extremely unlikely that a country would start an armed conflict to drive out migrants or attract them to the relevant host country.

<sup>11</sup> This argument is almost certainly true of the program that was recently under consideration by the Spanish government to encourage Romanian worker migrants to return home. This program would have been modeled after the one they utilized to persuade Latin American immigrants to leave Spain during the recession of the late 2000s and early 2010s (Lungescu 2009; Donadio and Schwartz). As part of the literature review indicates, there is also some preliminary evidence that the overall migration of CEEC10 workers to the EU15 countries decelerated considerably due to these global economic troubles (BBC News 2009a; Donadio and Schwartz).

<sup>12</sup> A Eurosceptic might assert that the EU should abandon its plans to bring more countries into the organization and create a single market for labor if such heavy resistance to these ideas exists. The intention of the EU’s leaders to continue these projects would likely be taken by that Eurosceptic as evidence of the elitist nature of the European project and a manifestation of the democratic deficit problem (McCormick, 141-149) described earlier. However, most mainstream European politicians seem committed to one degree or another to these causes, so workable solutions to these problems must be explored.

<sup>13</sup> This idea is also inspired at least partly by the American government’s post-NAFTA trade adjustment assistance programs that are designed to help workers who can demonstrate that they have been displaced from their jobs due to increased free trade with Canada and Mexico (Baicker and Rehavi, 241-243).

<sup>14</sup> Some individuals might contend that the evidence concerning the economic advantages of the single market have been public and well-known for a long time but that average Europeans simply do not learn much about what the European Union is or does. This knowledge deficit (McCormick, 136) issue has been a challenge for federalists and other pro-Europeanists for some time now, and is unlikely to be solved completely in the near future.

<sup>15</sup> Please note that this endeavor’s contributions to the literature on worker migration more generally and the specific question of CEEC10 post-accession migration potential are discussed in the first main section of this chapter.

<sup>16</sup> Although there is some doubt (McCormick, 145-146) that European voters pay much attention to what the EU does when they decide for whom to vote, the May 2010 election in the German state of North-Rhine Westphalia provides evidence that they do care about that under certain circumstances (Kulich).

<sup>17</sup> Another source of the apparent inconsistency between rhetoric and reality in this situation is related to the time horizons often placed on the policy of free worker migration. Generally, the idea of an open market for all of the means of production has been rhetorically placed in some far-distant perfect future when the benefits of that development can be enjoyed by all EU member-state citizens. As a politician, it is rather easy to be in favor of such a utopian notion. However, it is quite another matter for the individuals

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who must pay the (hopefully short-term) costs of creating that market and facing their wrath at subsequent elections. Again, the divergence here does not indicate any sort of hypocrisy on the part of EU15 politicians, but it does demonstrate the difference between the generally enjoyed benefits that support the single market scheme and the specific, directed and immediate costs of implementing it.

<sup>18</sup> One might also be persuaded to understand this clash between reality and rhetoric as evidence of domestic-level interest group or ideological competition between the industries, organizations and political parties that would have benefited from an expanded single market and those that would have been harmed by it. A productive line of future research might include a comparative case study (possibly using polling data) between countries that activated and rejected the free labor mobility derogation in 2004 and 2007 to observe what sorts of differences might have led to the decisions that these countries made.

<sup>19</sup> The two-level game idea may also allow one to hypothesize about the reasons for why the staff and leadership of the European Commission seem to be so rhetorically devoted to the free migration of workers but still develop programs to keep many of the workers who might benefit the most from that policy at home (e.g., special job training programs for particularly depressed regions; agricultural subsidies for small farmers). These programs may be a response to demands by member-state politicians who must assist their economically disadvantaged citizens in exchange for their votes and to demonstrate the utility of the EU to those voters (who will hopefully support their countries' membership in that organization). Once again, a combination of specific incentives and the two-level game perspective could allow one to clarify an apparent contradiction between the behavior and statements of European policymakers. In fact, case study research should be undertaken in the future to determine whether this hypothesis is reasonable.

<sup>20</sup> Many of the future research suggestions described in this section could apply equally well to the baseline systems model, but these proposed improvements are separated out here for expository purposes.

<sup>21</sup> Given Iceland's recent application for EU membership (BBC News 2010), there may be an even better reason to include this country in the statistical model's data set (i.e., this action would avoid the double extrapolation problem inherent in the CEEC10 projections if one desired to forecast Iceland's post-accession worker movement). However, it should be omitted if one wanted to be totally consistent here with the practices adopted for predicting accession-state worker migration.

<sup>22</sup> A follow-up study that would be interesting but problematic to complete would be to check the accuracy of the statistical model's forecasts against the number of CEEC10 workers who have actually arrived in Germany (and the rest of the EU15 countries) since CEEC8 accession. While the migration data for Germany are available from the *Statistisches Bundesamt* (and for the EU15 countries from Eurostat), the problem is that the model is geared towards creating medium to long-term predictions. It has only been a few years since 2004, and it would be inappropriate to try to draw solid conclusions about its performance using the first few years of post-accession worker migration data regardless of what those results turned out to be.

<sup>23</sup> Since Iceland is already part of the Schengen area (McCormick, 160; Poole, 163; Hailbronner, 73-74) and its economy is considerably more prosperous than those of the other current applicants, the implications of the next several sentences do not apply to that potential member state.

<sup>24</sup> Another potential extension and improvement to this investigation would be to deal with the post-CEEC8 deflection effect that altered the distribution of these countries' worker migrants in the EU15 economies. Part of the literature review chapter of this study indicates that this phenomenon has been observed and some updated distribution numbers are available (Ruhs, 11; Boeri and Brücker 2005, 11, 14-16), but these figures are not reported for one particular base year currently. In order for this research augmentation to be accomplished, one would need to drop the assumption of a pre-accession knowledge base and gather consistent distribution data from post-2004 labor force survey and national census reports. This step would certainly be necessary if this study were to expand its concerns to individual member-state level worker migrant distributions, but it might also improve the overall EU15-level projections depending on how greatly the deflection effect attenuated the predominance of Germany as a migrant-destination country.

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Obviously, the accuracy of that contention would not be known until after the forecasting period had expired, but it might be worthwhile to perform these alternative projections anyway as a comparison to the ones that are reported in this investigation.

<sup>25</sup> Any model that tracks gross migration to and from receiver countries can be modified to follow both simultaneously. However, this alternative model would be constructed around the notion of gross rather than net migration, which is the reason for the language choice in this sentence. It should also be noted here that statistical models that use gross in and outmigration rates to and from the receiver countries as their dependent variables would be necessary to operationalize this systems model. In fact, some statistical modeling may be necessary to operationalize any of the new relationships described in this section of the conclusion.

<sup>26</sup> One could also utilize age as an explanatory variable in the systems model to investigate the effects that aging societies have on economic growth, employment, and migration rates. The initial expectations of such a model would be that aging societies would have slower economic growth and a need to attract migrants to replace retiring native workers, but any comprehensive exploration of these ideas must await a future version of this research.

<sup>27</sup> This argument ties into the “brain drain versus brain gain” or “brain circulation” debate (Straubhaar and Wolburg; Favell et. al., 11-13) referenced in the previous chapter’s baseline systems model new relationships discussion. These concepts should not be confused with “brain waste” (Brücker and Damelang, 30-31), which is when high-skill migrants take low-skill jobs in the receiver economy. Additionally, some low-skill migrants may be necessary to fill jobs that native workers will not accept for whatever reason (Massey et. al. 1998, 28-34). However, this extension of the present research is less interested in these workers than the highly-skilled ones and are left aside for the moment.

<sup>28</sup> Even though this outlook is a highly Eurosceptical one and is not held by most members of the European public, the Eurosceptic position does manage to attract some electoral support, especially during votes for the European Parliament (Dinan 2005, 5, 271-272).

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- Zulauf, Monika. 2001. Migrant Women Professionals in the European Union. Palgrave. New York.

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### Education

- Ph.D. May 2010 Indiana University, Bloomington. Major fields: comparative politics and public policy. Ph.D. Minor: REEI. Dissertation Title: "Central and Eastern European Labor Mobility to the EU15 Countries Before and After European Union Accession".
- M.A. August 1997 Pennsylvania State University. Major fields: international relations and comparative politics.
- summer 1996 Inter-University Consortium for Political and Social Research summer program. Courses on maximum likelihood estimation and categorical data analysis.
- M.S. May 1995 Yale University. Major field: synthetic organic chemistry; research on memprenone synthesis.
- B.A. June 1993 Kalamazoo College. Major fields: chemistry and political science. Senior thesis in physical chemistry.
- fall 1991-92 University of Bonn. German language and politics courses.

### Professional Experience

- Fall 2008 to Spring 2009--Visiting Instructor, IPFW. Course assignments: Introduction to American Politics (three sections each semester), Politics of the European Union (fall), Sports and Public Policy (spring), Rightsapalooza (team taught; spring).
- Summer 2005--Research Assistant. Worked under supervision of Dr. Michael Wolf on Introduction to American Politics textbook revision.
- Fall 2003 to Spring 2008, Fall 2009 to present--Associate Faculty, IPFW. Course assignments included: Introduction to American Politics (often multiple sections each semester), Scandals and Conspiracies, Politics of the European Union, Politics and Film, Sports and Public Policy, and international relations section of Introduction to International Studies.
- Summer 2003--Research Assistant, Mike Downs Center for Indiana Politics. Worked under supervision of center's director, Dr. Andrew Downs, on project to develop on-line resource on Indiana state politics for secondary school students. Separate project involved renovation of political science departmental web page.
- Fall 2002 to Spring 2003--Recipient of Preparing Future Faculty Fellowship at IPFW. Course assignments included: Introduction to American Politics (Fall, Spring), East European Politics (Fall), Sports and Public Policy (Spring) and international relations section of Introduction to International Studies (Spring).
- Summer 2001 to present--Grader for Independent Study Office, IUB. Graded lessons for various correspondence courses: Philosophy of Work, Introduction to American Politics (to September 2004), Political Terrorism (to January 2005), Social Movements (from July 2005; semester-based OnCourse version from August 2008), Making the Most of Your

Close Up Experience (October 2006 to March 2008), State and Local Politics (from December 2008).

Summer 2001--Worked for Societas, Inc., an educational evaluation firm, under supervision of Dr. Amanda Rose as free-lance data analyst.

Spring 2001 to Summer 2002--Research Assistant. Worked under supervision of Professor Kenneth Bickers on Joyce Grant Project. Duties included maintenance of Policy Currents newsletter web page and constructing a systems model of State of Indiana workforce investment sector.

Summer 2000--Research Assistant. Worked under supervision of Professor John Williams on Workshop in Political Theory and Policy Analysis GIS project. Duties included data collection, management and mapping.

Spring 2000--Research Assistant. Worked under supervision of Professor John Williams on Workshop in Political Theory and Policy Analysis GIS project. Duties included data collection and management, mapping and supervision of undergraduate assistant.

Summer 1999--Research Assistant. Worked under supervision of Professor John Williams on Workshop in Political Theory and Policy Analysis GIS project. Duties primarily concerned with mapping capital improvement project data using GIS software.

1998-2000--Associate Instructor at the Student Academic Center. Course assignment: Learning Strategies for Finite Mathematics (Fall 1998; Spring 1999; Fall 2000); included tutoring at Briscoe (1999) and Ashton (1999-2002) Academic Support Centers in chemistry and mathematics, teaching chemistry sections of MCAT preparatory class (1999-2000; 2000-2001; 2001-2002) and leading numerous workshops on various academic support subjects.

Summer 1998--Instructor. Course assignment: Introduction to Public Law.

1998-1999--Associate Instructor. Course assignments: Introduction to British Politics (Spring 1998) and Introduction to American Politics (Fall 1999).

1997-2002--Research Aide. Worked under supervision of Professor Jeffrey Hart on general research duties including library and Lexis-Nexis searches (1997-2001). Also worked on university-wide retention project with Professor Kenneth Bickers (1998-1999) and on the multi-disciplinary International Forestry Resources and Institutions (IFRI) Research Program under supervision of Professors John Williams and Elinor Ostrom (2000-2002).

Summer 1997--Research Assistant. Worked under supervision of Professors Robert O'Connor, Ann Fisher and Richard Bord on three separate projects. Duties included entering and verifying more than 1500 surveys, tracking survey response rates, and phone recruitment.

1995-1997--Teaching Assistant. Course assignments: Introduction to American Politics; American Foreign Policy; Introduction to International Relations; Introduction to Comparative Politics.

1993-1995--Research Assistant. Worked under supervision of Professor John Wood on synthesis of naturally occurring membrones.

### Professional Work: Publications and Conferences

- Wolf, Michael, Andrew Downs and Craig Ortsey. 2010. "Who's Your Tea Party? Evidence from Indiana." Published on Pollster.com on May 12, 2010.
- Ortsey, Craig. 2010. "A New Long-Term Forecast of Post-Accession CEEC10 Labor Mobility to the EU15 Member States." Paper presented at Midwest Political Science Association Conference, Chicago, IL. April 2010.
- Ortsey, Craig. 2010. Served as discussant on "Minority Rights in Europe" panel at Midwest Political Science Association Conference, Chicago, IL. April 2010.
- Ortsey, Craig. 2009. Served as discussant on "Immigration and Migration in European Politics" panel at Midwest Political Science Association Conference, Chicago, IL. April 2009.
- Ortsey, Craig. 2009. "Two Sides of the Same Coin? Similar and Contrasting Views of the American Character and Experiment in *The Federalist Papers* and *Democracy in America*." Presentation at Remnant Trust conference: "The Shaping of the American Character." Fort Wayne, IN. January 2009.
- Ortsey, Craig. 2008. Revision of Independent Studies course: Contemporary Political Problems: Social Movements and Protest in Democracy. Indiana University. Bloomington.
- Ortsey, Craig. 2006. Creation of new Independent Studies course: Making the Most of Your Close-Up Experience. Indiana University. Bloomington.
- Ortsey, Craig. 2005. Revision of Independent Studies course: Philosophy of Work. Indiana University. Bloomington.
- Wolf, Michael and Craig Ortsey. 2004. "British Public Opinion," from Geer, John (ed). Public Opinion and Polling around the World: A Historical Encyclopedia. ABC-CLIO. Oxford.
- Ortsey, Craig. 2003. Revision of Independent Studies course: Introduction to American Politics. Indiana University. Bloomington.
- Ortsey, Craig. 2002. Revision of Independent Studies course: Contemporary Political Topics: Political Terrorism. Indiana University. Bloomington.
- Cornwell, Derek, George Ehrhardt and Craig Ortsey. 2000. "Monetary Independence, Mobile Capital, and Transitioning Economies: An Exploratory Analysis." Paper presented at Southern Political Science Association conference, Atlanta, GA. November 2000.
- Ortsey, Craig. 1999. "Peace: Bread or Land?" Paper presented at Midwest Political Science Association Conference, Chicago, IL. April 1999.
- McCann, Erin, Glenn Janes, Craig Ortsey and John Wood. 1997. "An Approach to Chiral Tri-Substituted Olefins: Synthesis of the C(1)-C(7) Segment of Halichomycin." *Tetrahedron Letters*, **38**(3), 303-4.

### Professional Work: Invited Presentations

- Ortsey, Craig. 2009. Served as panelist on "The Cold War 20 Years Later: Pope John Paul II's Visit to Poland" television program. June 16, 2009.
- Ortsey, Craig. 2009. Served as panelist on "Words of Change: The Development of the American Character" television program. January 18, 2009.

Ortsey, Craig. 2008. Presentation for International Education Week. "EU--Where To?" November 17, 2008.

Ortsey, Craig. 2006. Presentation at Fort Wayne International Affairs Forum. "On a Journey to...Where? EU Enlargement in the 2000s." March 14, 2006.

Ortsey, Craig. 2003. Presentation at IPFW Anthropology Club Luncheon Lecture Series. "Sports and Society, or Why Do These Guys Get Paid So Much?" October 1, 2003.

### Service

IPFW Remnant Trust committee member, Spring 2008 to Spring 2009.

Grader for Advanced Placement U.S. Government and Politics exam, June 2008.

Graduate Student Organization (GSO/GPSO) Representative from Political Science Department, Fall 1999 to Summer 2002. Served as chair of Graduate Government Committee that wrote new constitution for organization and established the GPSO as a fully functioning graduate and professional student government, Fall 2001 to Summer 2002.

Bloomington Faculty Council, graduate student member, Fall 2000 to Spring 2002.