Path Dependence, Transformation and Convergence-A Mathematical Model of Transition to Market

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1.1 Introduction

The economies of Central and Eastern Europe (CEE) have been recognized as posing unique challenges to study. The scope and nature of their political and economic development processes vary widely across the region, are characterized by substantial volatilities and are inherently complex. In this context, a renewed interest in the mechanisms of economic transition has arisen in order to explain the effects of Eastern European integration into the European Union as well as the consequent integration into global economic structures. This approach, which we shall refer to as "transition dynamics" ("*TD*"), differs significantly from the more traditional macro-economic and political science focus on purely internal processes of change. In this regard, the CEE transition to market can be described as a process characterized by *out-of-equilibrium* dynamics and a heterogeneous competitive landscape with high levels of complexity.[1]

1.2 Previous Studies

Previous studies of the CEE transition process have employed a variety of approaches, most of which can be classified as "*economic transition*" theories ("*NET*" for Neoclassical Economic Transition theories). A smaller, but perhaps more interesting group of studies is based upon economic transformation theories (of which transformation dynamics is a particular subset). This approach to the problem of economic change in Central and Eastern Europe is built around a dynamic or systems evolution approach to economic change and tends to rely upon more quantitative models of economic processes, aiming to explain dynamics rather than stable equilibria.

As mentioned above, the NET approach is typically associated with neoliberal and neoclassical economic interpretations of political and economic events. While the

[1] In this regard, complexity might best be defined as the emergent relational properties of structures which in the past have frequently been regarded as complicated, or an environment so characterized by "complicatedness" that its treatment has been relegated to approximation by *random* structures. This paper is designed, in part, to address some of the less obvious underlying regularities which can help explain apparently random, constant fluctuations, policy changes and reversals in the CEE economies as they move towards the more regular economic behavior consistent with EU membership.

transformation approach to Eastern European economic change is generally more concerned with modeling dynamic processes, it too carries with it interpretations stemming from Marxist political economy and regulation theory (Pavlinek, 2002), something not typically seen in "evolutionary economics" studies of Western European Economies.[2]

From this complex perspective, the transition process can be characterized in terms of the revolutions and political changes that have signaled the end of the centrally-planned party-state system, the economic reform, and, thirdly the impact of reform. The TD framework views reform as a broad mechanism of internal and external change; that is, the processes of *marketization* and globalization led by the liberalization of foreign trade and the accession to international structures. A more general feature of the TD framework is the use of evolutionary models to describe institutional roles and structures (Aoki, 2001a).

1.3 Embedded Markets

Additional concepts which have come into general use in the literature of transition are the "plurality of transitions" (Stark, 1992), and the treatment of continuous negotiation between simultaneous processes of privatization, democratization, and globalization. All of this, in turn, takes places in an institutional context of *embedded markets*. In the present paper, we advance a mathematical model that clearly differentiates amongst these various mechanisms with minimal generalization. The evolutionary nature of markets and the complexity of the institution-building are characteristic of the entire CEE region, even for the countries in the CEE that are now part of the European Union. In all off these cases there are ongoing obstacles and complications in the movement towards free markets. These concerns are particularly noticeable in the areas of re-nationalization and privatization in Hungary, administrative obstacles to entrepreneurship in the Czech Republic, and high unemployment and deficits in Poland).[3]

2.1 The Transition to Market- Birth and Evolution of Markets in a Global Landscape

The transition to market is akin to a natural experiment on how markets are born. The CEE countries are in a process of *transformation* from different degrees of centrally planned economies to a market oriented economy. The goal of transition is not a static notion of free market economy, but an open-ended adaptation to a world which is itself in flux of transformation. The outcome of transformations in CEE is expected to be a set of different forms of capitalisms interconnected into a Western European system (Deacon, 2000). Among the unique features of CEE markets is the fact that informal institutions differ greatly from those of Western market economies, such as wide-spread traditional value systems (including collectivist, particularist, family-oriented values, and religion).

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[2] For details, see the working paper archive of the Danish Research Unit on Industrial Dynamics (DRUID) at http://www.druid.dk/wp/wp.html

[3] European Bank for Reconstruction and Development, as quoted in BBC News Online, various.

Markets - especially for capital and skilled labor – are often thin or illiquid and inhibited by numerous market failures (Estrin and Meyer, 2004).

2.1.1 Foreign Direct Investment

A key feature of Central and Eastern European markets and foreign direct investment flows in these countries is the growing integration with the European Union. About 60% of the region's Foreign Direct Investment (FDI) stock has been historically held by MNC's based in countries of the EU (UNCTAD, 2000). The EU has established strict criteria that aspiring members must adhere to in order to join the European Union. The economic environment, as well as the competitive advantages that MNC's seek in Central and Eastern Europe, is likely to undergo considerable change as these countries' integration to the EU advances (Tihanyi and Roath, 2002). The institutions of regional integration include EU-conform regulations, enforcement of property rights, free flow of products and resources, specific anti-inflation measures, promotion of economic growth and local competition, and a prudent fiscal policy. CEE markets are distributed in widely varying positions with respect to the economic environment of the European Union, but even for those countries aspiring to integrate rapidly, many remain burdened with unprofitable state-run enterprises, poor corporate governance structures, weak or inefficient institutions and troubled socialist era welfare programs. EU accession is not yet a panacea for these countries, and *institutional idiosyncrasies* are likely to persist in the years to come.

The Governments of the CEE countries play one of the most vital roles in relation to the strategic options that are available to MNC's. Governments and the policies they set have a direct impact, for example, on taxes, interest rates, incorporation laws, ownership rights, repatriation of profits, and antitrust laws. Although the model of transition proposed here is focused on the transition economies of Central and Eastern Europe, there is some broader applicability to other countries going through the same processes in other regions of the world. Among these countries are the rest of the NIS countries, Mongolia, China, Vietnam, Algeria, Cambodia, the Lao People's Democratic Republic, Nicaragua, the People's Democratic Republic of Korea, and Tanzania.

2.1.2 Transition Issues

The transition from a centrally-planned economy to a market-based economy raises a series of broad, general issues. For example, the literature on transition recognizes the fact that reform policy implementation by the governments of countries in transition is only partially effective in even the most successful transitions. History and geography also shape the inherited structure of the economy, its administrative structure, institutional capacity, and political system (The World Bank, World Development Report, 1996). Finally, the transformation of the CEE economies occurs under the influence of external forces, such as foreign investors and international institutions. In analyzing these factors, we have found it increasingly apparent that the transition process can best be characterized by focusing along three dimensions:

1. *Initial conditions and their effects on the transition path including their overall relative impact (Initial Conditions)*
2. *Elements internal to the transition process itself which are linked to economic and institutional transformation* **(***Institutional Structure) and,*
3. *External forces influencing transition (The Convergence Factor)*

3.1 Three Pronged Typology for Transition to Market

The three dimensions of the transition process presented above have all been previously discussed in the literature. The present study offers a novel theoretical explanation of the *mechanisms of transformation* and further argues for a *normative* view of transition that expresses in functional form not only the numerical evidence of transition (e.g. macroeconomic indicators, amount of foreign direct investment, etc.) but also the more qualitative aspects of path dependence and convergence. Table 1 presents a typology which describes the three dimensions of transition along with their respective mechanisms of action and explanatory frameworks (taken from Wright, 2005).

Table 1: The Transition Process and Factors Affecting It

	Mechanism/Explanation	*Elements*
INITIAL CONDITIONS	**Path Dependence**	✓ Initial level of development and economic distortions ✓ Policy induced distortions (black market, trade dependence, repressed inflation) ✓ Initial level of development ✓ Natural richness
INTERNAL FACTORS DETERMINING TRANSITION PATHS	Reform Goals, Means and Limitations **Transformation**	✓ Macroeconomic stabilization progress ✓ Sectoral reallocations ✓ Property and bankruptcy law development ✓ State ownership reduction ✓ Variety in transition indicators
EXTERNAL FORCES	Positive Reinforcement **Convergence**	✓ FDI- reinforcing liberalization and institutional reform ✓ Economic integration and EU accession (adoption of W. European laws and institutions, stabilization) ✓ Outside influences: IMF, etc.

Source: Roxana Wright, Unpublished Doctoral Dissertation, Southern New Hampshire University, 2005.

3.2 Characteristics of the Transition Process

An accurate characterization of the transition process in the CEE region needs to take into account the heterogeneity of starting points and historical events that have marked the beginning and advancement of the various CEE countries' change process from planned economy to capitalism. Initial conditions in the system are of decisive importance when determining the "next step". The institutional system has advanced through long evolutionary developments and short revolutionary episodes. Among the CEE states, Slovenia, Croatia, the Czech and Slovak Republics and Hungary were the countries with more modest structural distortions. Preliminary comparisons between successful reformers (Poland, Hungary and the Czech Republic) and less advanced market economies in the CEE provide support for the view that the differences in restructuring, effective competition and economic performance are related to both policy factors (the development of credit and technical assistance programs) and non-policy factors ('path dependence'). Contrary to conventional wisdom, economic development does not naturally converge towards a stable solution, is not fortuitous nor is it deterministic.

According to the World Bank Report (2000) the transition process in the CEE started with a sharp decline in GDP followed by recovery. The onset of transition was accompanied by severe shocks, also tied to the disruption in institutional and technological links, the supply of inputs and the delivery of outputs. The financial crises of the 1990s, such as those in Mexico, East Asia, and Russia, also contributed to delaying or interrupting the recovery of output. War and civil struggles in Moldova in 1992, and in FYR Macedonia in 1991–94 had a negative impact on infrastructure development and reforms needed for successful transition. The transition recession is considered now to have ended, as all countries in the region have recorded growth subsequent to year 2000. The recovery has varied greatly across countries: for example, Bulgaria and Romania had about two years of output decline after the initial recovery, Albania returned to recession after the 1997 financial crisis. Most of the countries in the region have been affected to varying degrees by the Russian crisis in 1998. It would appear that the recovery of output benefited from foreign investment as a source of capital and new technology and also as a signal of confidence in the transition progress. World Bank research in 2000 found that initial conditions explain more differences across countries during the initial period of output decline (1990–94) than over the subsequent years of transition. Initial *distortions* in the economy- including severe repressed inflation or high black market exchange rates and absence of pre-transition policy reforms—are most closely associated with lower performance during the first years of transition. Initial *institutions* and the presence or absence of "market memory" (number of years under socialism) were found to be strongly correlated to variations in subsequent performance. However, while the initial conditions had a greater impact on the initial collapse of output than on the subsequent recovery, the impact of institutional policies became stronger as transition progressed.

3.2.1 The Impact of History

The CEE transition economies have significantly different histories, reflected in their institutional and legal traditions. Since the fall of communism, they have followed various political paths, have experimented with privatization and have had different levels of success in building an institutional environment indicative of a market economy. Not all communist countries were centrally planned in the Soviet-type mould. Yugoslavia - which has since turned into five successor states of Slovenia, Croatia, Serbia and Montenegro, Macedonia, and Bosnia -had adopted its own lighter form of economic planning in 1952. Countries in the former Soviet bloc varied significantly in their degree of openness to international trade. A few countries were virtually autarchic; for example, in 1989 Albania exported only 5 percent of GDP and Romania only 12 percent, which are exceedingly low trade shares for small economies in the middle of Europe. Other countries exported a larger share of GDP, but mostly within the CMEA trading arrangement between Soviet bloc economies. The countries that are now part of the European Union had relatively high levels of trade, at least by the standards of transition economies, and exported mainly to developed Western economies. These differences in trade clearly reflect the extent of market interconnectedness, but also reveal something about the levels of competition in these economies and their exposure to market-oriented business practices.

3.2.2. Patterns of Reform

The patterns of reform followed by transition countries in the CEE fall within two contrasting approaches: a rapid, all-out program of quick reform or a partial, phased reform. The two paths of reform have not been followed at their extreme by any country in the region. The initial macroeconomic conditions may have impacted policy choices: policymakers in most CEE countries were not able to assure control over the economy in its partially-reformed state, which could explain why early attempts at partial reform had failed to raise efficiency, particularly in the countries of the ex Soviet Union. The role of different political heritages could not be ignored: citizens' loyalties toward pre-transition regimes varied greatly. As reviewed below, legacies of democracy and markets remained strong in some countries. Geography made a difference: countries closer to Western Europe had been exposed to European political norms and culture. Although in most CEE countries the transition start was marked by a "political breakthrough", some countries followed a different pattern- Ukraine's first government, for example, focused on asserting national identity, rather than reform. Some countries started with a more favorable economic situation, reflected in lower inflationary pressures, less dependence on the CMEA system, and a more favorable position to develop new trade links. Countries also differed in their level of development, industrialization and income. These conditions are reviewed in more details below, however, separating the contributions of initial conditions, history in general and geography is extremely difficult (World Development Report, 1996).

4.1 A Mathematical Model of Transition to Market

The purpose of transition, the evolution towards market, can be described as an iterative process of sequential improvement (although the dimensions of transition are affected by a series of factors that may not necessarily lead to improvement, but rather deterioration). A mathematical illustration of the evolution process is presented as follows:

$$X_{n+1}^{i} = X_{n}^{i} + \frac{1}{w+n}\left[q_{n}^{i}(X_{n}) - X_{n}^{i}\right] + \frac{1}{w+n}\mu_{n}^{i}(X_{n}) + f_{y}\left[(\frac{1}{w+n}\mu_{n}^{i}(X_{n}))/Y_{n}^{WE}\right]$$

where

$X_n = (X_n^1, X_n^2, ..., X_n^N)$ is a vector of economic and institutional features (1 to N) at time n (after n iterations).

{q} is a sequence of functions mapping features into probabilities of improvement towards market at time n.

b_1 is the vector of initial conditions.

$w = \sum_i b_1^i$

Improvements towards market follow the dynamics:

$$b_{n+1} = b_n^i + \beta_n^i(X_n), \textit{where the random variable } \beta_n^i(X) = \begin{matrix} 1, \textit{with probability } q_n^i(X) \\ 0, \textit{with probability } 1 - q_n^i(X) \end{matrix}$$

$\mu_n^i(X_n) = \beta_n^i(X_n) - q_n^i(X_n)$

Y_n represents the vector of economic and institutional features characterizing the EU

f_y is a factor determining the rate of convergence towards western features of market economy (WE); could be expressed as an exponential function

$f_y = e^{c(n-1)}$, *where c* is a convergence factor.

The mathematical expression reflecting the evolution towards market structures includes a "driver"(the first two terms at the right of the equation above) that takes into consideration path dependence (role of initial conditions), a perturbation component (the middle term at the right of the equation) that considers the internal factors affecting improvements towards market, and, finally a convergence component (the last term at the right of the equation) which is a measure of external influences (mainly FDI and EU accession/agreements), determining the rate of convergence towards Western features of market economies.

5.1 Path Dependency as an Explanation for Various Transition Paths in the CEE-Transition Process Initial Conditions Analysis

The first two terms in the mathematical formulation are a generalized Polya process which has previously been used to describe path dependent processes (Arthur, 1994). Notably, however, the process itself has been modified to reflect the specific conditions and processes of transition to market in the CEE countries. Given that the countries in transition progress at different paces and that the probabilities of improvements are not always comparable, this general model incorporates the path-dependent movement towards market in a vector of economic and institutional features and a sequence of functions mapping these features into probabilities of improvement (rather than applying a strict functional form for explaining evolution in transition).

The extent to which transition can be considered a common process depends on the relative strength of the common legacy of communism versus country-specific factors. Despite a common legacy of planning, the transition economies of Central and Eastern Europe started out under different circumstances in terms of initial level of development, macroeconomic distortions, different levels of integration into the trading system of the socialist countries, and a differing extent of prior reforms. Using information available from the World Bank, the IFC, and various estimates of Melo et al (1997), Principal Components Analysis results shows that for the entire region the most relevant initial conditions can be clustered as (a) initial distortions, (b) level of development, and, (c) natural richness or resources. The results of this classification reflect the large importance of initial economic distortions induced by the policies pursued during communism on one hand, and the existence of natural resources, on the other hand.

Almost all research on post-socialist transformation recognizes some form of path-dependency (Bandelj, 2004). Economic institutionalists argue that previously existing institutions, formal and informal, constrain the range of institutional alternatives from which actors (i.e. governments) choose, locking them into certain courses of action which may be difficult to reverse. Existing institutions also set a range of acceptable options that are available to policy makers.

5.2 Transformation- Internal Forces Affecting the Transition Process

Although path dependency would suggest limits in the feasibility space for policy choices, the institutions of the CEE are by no means immutable or unchangeable. As the first two terms in the iterative process show, the process of change and the potential outcomes are tied to the inheritance of the past and processes of transformation in the economies with the influence of perturbations in the system. The essence of economic transformation from plan to market is the replacement of one set of institutions governing economic activity by another. The Western market economies have built their institutions over decades, varying as a result of different historical evolution and underlying cultures, and supported by strong and impartial states. The path dependency of institutional frameworks has led to a variety of “business systems” that differ among USA, Asia and West Europe. For the last decade and a half, countries in Central and Eastern Europe have been building their institutions under strong outside influence. Policy choices made during the period of radical change around 1990 created institutions and established various distributions of power. In many countries, the weak legal framework permitted opportunistic behavior, rent shifting, bribery and corruption. In some countries, vested interests have been created that did not benefit from further reform. Although it would be impossible to account for all such developments, grouping them into a perturbation effects is an elegant solution to potential over-generalization.

The interaction between the subsystems of a society in transition may be defined by positive feedbacks where the stability in the social system creates support for institutional change, which in turn leads to clear rules for political institutions and a consistent economic policy in the area of stabilization, liberalization and privatization. Such a policy impacts positively the production system, and there is an incentive for the continuation of transition supported by the value system as well. Progress towards stabilization improves a country's rating from international institutions and increases foreign investors' confidence, generating an inflow of capital and entrepreneurship which then contributes to further advancement on the transition path.

However, it is also possible that an unstable and conflicted social system, where the competence of newly established institutions is unclear, leads to an inconsistent and unbalanced policy. Such a policy does not convince the agents in the market and does not surpass "critical mass" to make the agents behave on market signals. Investors refrain from capital injection, and continue to use "unconventional" methods of maintaining an acceptable profitability level, with negative effects on the production system. This *vicious circle* continues as the value system does not support change and the economy is set back further by restrictions to trade, unrealistic expectations and decreased confidence from the rest of the world (Mygind, 1994, Mygind, 1996).

5.2.1 Varying Results

The reforms in former socialist countries of the CEE have created a variety of results: while some countries resumed growth after a few years of a transformational recession, others experienced severe declines with little subsequent recovery. In general, Central European countries returned to positive growth 2 or 3 years after the beginning of transition whereas the former Soviet Union (FSU) countries experienced prolonged periods of economic decline (4-5 years or even longer). The evolution of countries according to their progress towards a market economy is quite heterogeneous and does not monotonically depend on time, suggesting that the factors governing growth are indeed sensitive to the progress in implementing reforms. The transformation from centrally planned economies to market economies has resulted in a group of countries approaching the finish line, while other countries have been languishing at various points along the path.

Some Central and Eastern European economies are already highly integrated into the European Union's structures, while many economies in the Commonwealth of Independent States (CIS), including Russia, have recorded uneven progress at best. Economic performance has varied widely, with the Central European countries of Poland, Slovenia, Hungary, Slovakia, and the Czech Republic generally performing better than the Baltic states of Estonia, Latvia and Lithuania. The Balkan states of Bulgaria and Romania, in turn performed better than Russia, Ukraine, and other countries in the Commonwealth of Independent States.

6. 1 Convergence- External Factors Impacting the Transition Process
Economic Integration and EU Accession Effects on the CEE

Despite a somewhat unfavorable external economic climate, the transition countries of the CEE display a reasonably good growth performance. The region as a whole now expands more rapidly than the EU; it is also catching up in terms of productivity. Russia continues to cash in on high revenues from energy exports and its GDP growth is accelerating while investments recover. Interestingly, in countries seeking accession to the EU, the integration process has been an essential element in their transition, as it provided governments with additional legitimacy in the adoption of western European laws and institutions and acted as an important stabilizing factor (EBRD, 2002). Recent research (Gros and Suhrcke, 2000) shows that countries that are now part of EU are closer to complete the transition. There have been important differences in how fast each transitional country has turned around. According to EBRD (various Transition Reports and Annual Reports), the CEE countries that are now part of the European Union were the first to show positive growth. Whereas a weighed average for Central and Eastern Europe including the Baltic Countries shows that the 1989 level is passed in 2000 (EBRD 2000), the differences between the CEE countries are evident- the 2000 production level for Russia is 61% and for Ukraine it is only 38% of the 1989 level, whereas the CEE countries that are now part of the European Union have caught up. This justifies the inclusion of a convergence term expressed as an exponential function with a convergence factor.

The set of regulations concerning internal trade within the European Union and other social and economic aspects of European life is called the "acquis communautaire". Under the terms of enlargement, the CEE[4] countries that aspire to become part of the European Union are required to adopt the entire "acquis" prior to accession. But some countries have negotiated "transition periods" during which they are allowed to gradually implement all the relevant regulations. The enlargement process of the EU is changing the business environment under which firms operate in prospective Member States. The removal of barriers to the flow of goods, services, capital and labor provides new market opportunities, increases competition in domestic markets, and facilitates access to new sources for inputs. Research carried out by the European Commission in 2003 stated that the adoption of the "acquis communautaire" ensures, on the one hand, improvement of the business environment and, on the other hand, leads to significant corrections in areas like emissions, waste management, product safety, working conditions, etc. In some fields, adaptation has already been completed in candidate countries, whereas in the most difficult areas (e.g. environmental regulations) there are transitional provisions postponing adjustments until a few years after accession. Although the process of taking over the "acquis" is a gradual one, it poses a formidable challenge for candidate countries and the firms operating there as it implies a continuous change of the legal and institutional framework.

Integration measures to the EU includes the removal of barriers to trade in goods which have already been widely reduced between EU and the candidate countries; the

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[4] The new EU member states since 2004 are Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia. Candidate countries to the EU are Bulgaria, Romania and Turkey.

elimination of restrictions to capital transactions (although the candidate countries have widely liberalized the conditions for capital movements already in the run-up to accession, in particular as far as foreign direct investments are concerned). These conditions refer to, for example, the protection of foreign ownership, the permission to repatriate profits and capital, and the equal treatment of foreign and domestic investors, the freedom to provide services and the freedom of establishment, and the free movement of labor (however, these rights do not yet apply between present EU Member States and candidate countries).

6.2 FDI, Politics and Economics

The transition from socialism to capitalism in Central and Eastern Europe is both a political and economic process. The reintegration of the CEE into Europe is one of the most important aspects in some of these countries' transformation. Current research (Dyker, 2001) analyzes the relationship between foreign direct investment flows and their effects on one hand, and the EU integration process, on the other. Some findings (Bevan and Estrin, 2001) suggest that countries excluded from the EU, typically because of poor progress in transition, will receive lower levels of FDI, which will further limit their transition progress. The implications are an increasing concentration of FDI into the more successful transition economies, and increasing differentiation in per capita income within the region linked with the inclusion or exclusion from the EU. This literature suggests that prospective EU membership could be an important determinant of FDI in transition economies. FDI is an important aspect of the transition process itself, and therefore of the business environment for investing firms. The literature finds that more MNCs can be enticed to invest in a CEE country when there is a viable potential for the country to increase its ties with the EU. The same literature has found that the process has the potential to be self-reinforcing by improving the country's credit rating and thus further stimulating foreign investment flows.

6.2.1 Reinforcement- Transition and Foreign Direct Investment

The inflows of FDI to the region match the improvements in political stability and transition progress (the Vienna Institute for International Economic Studies, 2002). FDI inflow was generally low before 1997, before some of the countries (mainly Romania and Croatia) changed their policies and started to attract more investors. Moldova, Albania, Bosnia and Herzegovina received higher amounts only since 2000 and Yugoslavia received significant inflows since 2001. Nevertheless, the overall amount of FDI has been small compared to the size of the countries. Insufficient regulation and control and an unclear institutional setting are among the barriers to productive activity of FDI.

7.1 Final Remarks- Mechanisms of Change and Sensitive Dependence on Initial Conditions

The model of transition suggested allows for the overlap of effects while accounting for all aspects of change. The mechanisms at play are obviously different for various countries. The equation is flexible in allowing one mechanism to take "predominance" over others, which reflects real developments in the region. For countries that are more advanced towards a market economy and more integrated within the European Union the mechanisms of change revolve around the harmonization with EU institutions and the advantageous positioning in Europe in terms of competitive advantages and value added activities. Many of these former socialist countries have liberalized their capital and labor markets. Other countries such as the Balkan states and Latvia continue to maintain a stronger state bureaucracy well after the collapse of central planning. Governments have however relinquished their coordinating power in the economy to a great extent. As these countries are also in advanced stages of becoming integrated in the EU structures, policies are guided towards harmonization and macroeconomic internationalization through Western European industrial links.

For countries less advanced in transition, strategic coordination from governments still prevails. It may be argued that some of these countries are still bounded by initial distortions in economic coordination and level of development, as well as inefficiencies in political markets. Despite a general growth trend, individual country trajectories show a variety of paths, differing in the timing of significant reform implementation and an initial increase in FDI inflows, although some regularities have been pointed out across the region. Countries with low initial distortions have overcome liberalization difficulties more promptly, whereas countries with less favorable conditions at the end of the communist years have taken longer to adopt momentous reforms. Hungary, for example, had the most noticeable increase in FDI inflows immediately after 1989 as the country proceeded quicker in liberalizing the economy. Like Hungary, Czech Republic and Estonia recorded relatively high foreign investments early in transition, but unlike in Hungary, FDI inflows have not leveled off later on. It is not until towards the end of the 1990s that the Balkan States and the former CIS countries adopt a fluent reform strategy and begin recording noteworthy investment flows.

Although the beginning of coherent transformation macroeconomic policies and openness to foreign investments and Western European structures marks a break from initial distortions, it is difficult to asses to what extent countries in CEE have overcome these distortions and made a break from past institutions. Most of trajectories in transition observed in the region are the result of rearrangements, reconfigurations, and re-combinations that yield the current conditions. But although this paper advocates a path-dependency approach, it should be noted that the mechanism does not condemn the CEE economies and the economic agents acting within them to simple repetition or retrogression. Rather than rigorously locking economies into certain paths, initial conditions leave a mark on the creation of future institutions.

Based on the previous discussion, we note that some of the current institutions and mechanisms of change represent a profound departure from both past institutions and from initial conditions. New systems guiding the progress of some CEE countries have evolved from old social and economic organization. While in more advanced markets, the government's role has changed and EU integration has had a consequent effect on economic progress, in less advanced countries the state still exerts a constraining and constitutive influence on the economy.

7.1.1 Institutional History

The transition experience so far shows that stabilization and structural reforms are related to exchange systems, taxation, and state-owned enterprise reform. While the entire region has progressed, the countries that were closer to the benchmarks of market economy early on in transition have advanced more in subsequent years. Countries that have been more successful in implementing policy reforms have also been more successful in implementing structural and institutional reforms. The slow development of institutions in some countries might have been due to the increased difficulty of developing institutions requiring changes in societal norms. It may be reasonably expected that policy reforms will eventually change these incentives for the actors in such an economy and contribute to the evolution of rules and institutions that are a better fit to market for economies and societies advancing in transition. As Aoki (2001b) notes, "only institutional arrangements that are mutually consistent and/or reinforcing may be viable and sustainable in an economy…It can be through the guidance of a particular, symbolic system presented in the transition process and recognized as 'prominent' or 'salient' (among the many possible) that agents' new strategic choices are induced to be coordinated. As agents' choices equilibrate, the guiding symbolic system becomes consistent with, and reconfirmed by, their experiences. It can then serve as their summary representations and thus it becomes established as an institution. The point is that some symbolic system precedes the evolution of a new equilibrium and then is accepted by all through their experiences."

7.1.2 Slow Reformers

It can also be argued that for slow reformers such as Belarus and Ukraine which started transition from a high level of distortion, the transformation process is in its incipient stages, with governments highly represented in enterprises and as coordinating agents. Although these countries benefit from involvement of international institutions, they have few Western European linkages. The same apprehensive approach to reform and restricted incentives for EU integration can be noted for other countries (Russia, Moldova) however the liberalization of prices and external trade have been aided by a relatively higher (although at low levels compared to other countries in the region) though fluctuating, FDI flow. Other parts of the region such as the Balkans and Central Europe have had a mix of quality in initial conditions but have amended their positions largely through the government's role and have been focused on the continuation and refinement of market institutions.

The main driver for change in intermediate reformers has been the liberalization of the banking system. Most countries advanced in transition still suffer from an incoherent competition policy and lack of flexibility in labor and capital markets. The "pull" of the EU integration is strong for the acceding countries, whereas integration has slowed down reform effects for the countries that have succeeded in joining the EU. Arguably as a result of initial high distortions and disjointed reforms some countries have advanced very slowly in transition. The countries of Central Europe have remained in front from the beginning of transition, while the Balkans and some of the Northern CEE countries (Lithuania, Latvia and Estonia have been perhaps most affected by the Russian crisis) have been slowly closing the gap. As we have seen, the road to transition has been more difficult and less traveled by successively lower ranked tiers of countries.

7.2 Concluding remarks

In the foregoing paper we have examined the relative performance of the former socialist economies and CEE countries in the transition to market. We identified three primary features of the transition, (1) Initial Conditions, (2) Institutional Structure and (3) External Factors, which provide the basis for modeling path dependence, transformation and convergence. We then presented a mathematical model of CEE evolution to market, which we described as an iterative process of sequential improvement defined by:

$$X_{n+1}^{i} = X_{n}^{i} + \frac{1}{w+n}\left[q_{n}^{i}(X_{n}) - X_{n}^{i}\right] + \frac{1}{w+n}\mu_{n}^{i}(X_{n}) + f_{y}\left[\left(\frac{1}{w+n}\mu_{n}^{i}(X_{n})\right)/Y_{n}^{WE}\right]$$

Using this model we then distinguish four different levels of achievement by four different groups or clusters of countries and attempt to analyze in detail the nature and causes of these differences.

The main contribution of the paper is the application of complexity concepts to the topic of economic transformation. The mathematical formulation presented here has not been previously associated with this type of problems. As evolutionary economics and the use of dynamic models are brought recently forward in replacing neoclassical methodologies and interpretations, our paper is one of the first to actually suggest an alternative model, with a clear mathematical description and real-world applicability.

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