TRADING PARTNERS AND ECONOMIC GROWTH IN TRANSITION ECONOMIES

by

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Abstract

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This paper empirically examines the extent to which a country's economic growth is influenced by the economies of its trading partners. The analysis incorporates transition economies case. Panel estimation results for more than 100 countries, including 25 transition economies, show that trading partners' growth has a strong positive effect on domestic growth. Trading partners' relative income levels are negatively correlated with growth, suggesting that trading with less developed country is beneficial for growth. No difference in either of the effects is found for transition economies. A general implication of the results is that countries benefit from trading with fast-growing and relatively less developed economies.

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GLOSSARY

Import-substitution strategy. Strategy aimed at stimulating industrialization.

Infant-industry argument. Need of protectionist measures for the newly emerging manufacturing sector.

Knowledge spillovers. Firms can acquire information created by others without paying for that information in a market transaction.

Learning-by-doing effects. Firms generate additions to knowledge in the course of manufacturing capital goods and cannot prevent this knowledge from flowing freely into the public domain.

LSDV Least Squares Dummy Variable Regression.

IV Instrumental Variables Estimation.

Chapter 1

INTRODUCTION

Why do countries vary so greatly in their growth performance? Why some manage to raise their standards of living dramatically and others lag far behind? Vast evidence suggests that such drastic differences in economic performance are by no means the outcome of a random process. Recent economic history reveals two important trends in the world economy that contribute to nations' well being. These are technological innovations and increasing interdependence of nations in the world economy. These two are reciprocally related. Increasing contacts among researchers and innovators across the world contribute to the process of innovation and help to avoid the duplication of research effort, whereas rapidly improving technology gives additional incentives for trade and integration into the world trading system. Therefore, an increasing number of studies appear on the issues of productivity and international integration as researchers try to understand recent growth experiences and provide future forecasts.

It is commonly believed that with growing economic integration across nations, economic developments in a country are significantly influenced by economic conditions abroad (The Economist, 2002). This paper attempts to investigate the trade-growth issue from a new perspective: through the economic conditions in trading partners. Despite an enormous number of empirical studies and theoretical advances on the topic of trade and growth, there is still a controversy among economists regarding how international economic policies and growth rates relate. The fact that this issue continues to generate immense empirical research suggests that the challenge of identifying the link between trade and economic growth still lies before us.

The concern is of great importance for all countries, though for transition economies accelerating growth is one of the means to improve quality of life, to catch up with Western standards of living. As Gros and Stenherr (2004) argue in their recent book, export-led growth is the only way Central and Eastern European countries can hope to catch up with Western standards of living. Taking into account this belief, in this work I will attempt to answer the question *How much trading partners matter for economic growth in transition economies?* As noted earlier there is extensive research on the relationship between trade openness and growth, but what has been neglected in the economic literature is the relationship between foreign economic conditions and domestic economic growth.

The objective of the thesis is to empirically examine to what extent trading partners influence economic growth in transition economies. In particular, how the relative income level and the growth rate of country's trading partners, after controlling for other growth determinants, affect the domestic growth rate.

There is an econometric study by Arora and Vamvakidis (2004), where this issue is addressed for a sample of countries excluding transition economies (the only two used are Poland and Hungary). Thus, I will conduct an analysis extended for transition economies case and incorporate a different approach in data construction. The motivation is simple: economic growth is an essential issue for all transition economies, and in particular for Ukraine, where positive growth rates were observed only since the year 2000. Thus, it is of interest to investigate how trading partners of transition economies influences their economic performance. In light of recent regional integration processes among countries in transition, such as the Single Economic Area (Russia, Belarus, Ukraine, Kazakhstan), this research becomes quite substantial and timely. Such a study might serve as support for national governments in designing trade policies in general, and specifically in determining main trading partners, including through integration processes.

The structure of the paper is as follows. Chapter 2 provides a review of the relevant literature concerning the issue of international trade and its impact on economic growth both on theoretical and empirical levels. Chapter 3 contains theoretical framework for the assessment of the effect of trade on the growth performance of a country. Chapter 4 overviews the empirical methodology and provides data description. Chapter 5 includes the results of empirical estimation. Chapter 6 contains conclusions and propositions for further research.

Chapter 2

LITERATURE REVIEW

The question how trade affect economic growth has long been debated among economists. This controversy continues today. In order to carefully investigate this disputable issue, it is important to look at both theoretical and empirical studies undertaken. First, I provide a review of formal theory developed on the subject and, then, turn to empirical studies in this area.

2.1 Theoretical Foundations

Formal growth theory provides two major frameworks: neoclassical (exogenous) and endogenous. Among the well-known exogenous growth models Ramsey (1928) and Sollow-Swan (1956) models can be quoted. Within the neoclassical framework, the sole determinant of long-run growth is the rate of exogenous technological breakthroughs. Therefore, the interaction with other economies in the standard neoclassical model brings about changes in the pattern of product specialization but not in the steady-state rate of growth. Thus, within the framework of exogenous growth model, trade policy will affect the equilibrium level of aggregate output, but not its rate of growth. Since I am interested in investigating the effects of trade policy changes on long-run growth rates, I will omit the neoclassical framework and proceed directly to the endogenous growth models.

Endogenous growth models explain the parameter of technological progress. Recent studies have provided novel ways of dealing with technological progress. They view innovation efforts that respond to economic incentives as a major engine of technological progress and productivity growth. The incorporation of R&D theories into the growth framework began with Romer (1990) and includes significant contributions by Aghion and Howitt (1992) and Grossman and Helpmann (1991). Part of this new theory also focuses on international economic relations, and in particular international trade, that links a country's productivity gains with economic developments in its trading partners. This theory identifies several mechanisms by which a country's external relationships might affect its growth performance. I give further consideration to the trade-cause-growth mechanisms and several theoretical models in Chapter 3.

2.2 Empirical Evidence

Largely due to the pioneer empirical investigations aimed at assessing the consequences of different trade regimes, over the last fifty years economists' views concerning the relationship between trade openness and economic growth have significantly changed. During 1950s, 1960s and 1970s protectionist theories were prevailing among economists and policymakers. Thus, import-substitution strategies aimed at stimulating industrialization were dominating, especially in developing countries. These industrialization strategies originated in the thinking of Prebisch (1950) and Singer (1950) and were based on the following two arguments: 1) in the absence of industrialization LDCs are doomed to suffer from an ever-growing gap between them and advanced economies; 2) infant industry argument (need of protectionist measures for the newly emerging manufacturing sector). The infant industry argument provided the major economic support for import substitution policies. Despite the dominating protectionist ideas, a small group of economists supported by the results of their own independent research argued that outward oriented economies outperform those countries pursuing protectionism. But it was not until the 1980s when a growing number of economists and policymakers started to turn to outward-oriented approaches. The first countries to shift from inward-oriented to outward-oriented policies were Taiwan, Singapore, and South Korea (Baldwin, 2003).

This major shift in conventional thinking of economists was facilitated by the pioneer multi-country studies on the relationship between trade orientation and economic performance in developing countries by Ian Little, Tibor Skitovsky, and Maurice Scott (1970) and Bela Balassa (1971). The most important contribution of these investigations was the comparative analysis between different countries of Latin America and Asia on how the degree of protection to intermediate and final goods affected relative profitability of sectors. The fundamental policy recommendation emerging from these studies was that developing countries should reduce the degree of protection and open up for international competition (Edwards, 1993).

Another flow of influential works during this period consisted of econometric studies that investigated, on broad cross-country data, the relationship between the rate of exports expansion and aggregate economic growth. Among them were works by Krueger (1978) and Balassa (1982). Krueger (1978) econometrically tested two hypotheses: 1) more liberalized regimes result in higher export growth; 2) higher exports have a positive affect on aggregate growth. Krueger concluded that there is a strong indirect effect of trade openness on growth: higher exports positively affect growth rates. However, there was no evidence of direct effect of trade liberalization on growth. Balassa (1982) criticized Krueger's results on the basis of inadequate classification of trade regimes, and proposed his own classification that incorporated both quantitative restrictions and tariffs. Balassa found strong evidence favouring the hypothesis that protectionist measures seriously hinder exports growth. However, when trying to test the proposition that trade policies affect growth independent of exports, he encountered the problem of measuring trade policy orientation. Thus, as a proxy for trade openness Balassa used the growth rate of exports, and finds a positive correlation between exports expansion and output growth. But, as justly pointed out by Sebastian Edwards (1993) in his influential survey, the use of such proxy for trade orientation is highly suspicious. The causality issue was not addressed: is it exports growth that causes output expansion or vice versa? Similar shortcomings were found in the majority of econometric works of that period. Most of the papers were criticized on the accounts of overly simplistic theoretical grounds, causality problem, and ignorance of other important growth determinants. A recent review of Srinivasan and Bhagwati (2001) also criticizes these cross-country regression analyses on the grounds of poor quality of data, weak theoretical foundations and econometric shortcomings. They argue that profound studies of country experiences will provide better insights in understanding the connections between trade and growth. Edwards (1993) resumes that "an important challenge that lies ahead for research in this area, is to obtain more reliable measures of trade policy and to investigate in greater detail the channels through which greater outward orientation affects growth."

In the early 1990s the so-called "new growth" literature appeared, which have actually made attempts to account for the criticism of previous literature and come up with better measures of trade openness. Improvements in growth theory of the late 1980s, more comprehensive data and new econometric techniques have stimulated these new attempts in investigating trade and growth linkage. Almost all of these studies find positive relationship between various measures of openness and growth. However, the most influential of these studies have recently undergone a detailed and carefully reasoned critique by Rodriquez and Rodrik (1999). As the authors claim their review picks up where Edwards' survey left off. The selection criteria of the works they include are based on the frequency of citations in textbooks and publications. Thus, their analysis comes down to four most influential papers in the field: Dollar (1992), Sachs and Warner (1995), Ben-David (1993), and Edwards (1998). What makes Rodriquez-Rodrik analysis unique is that they use authors' original data sets as well as in some instances new updated datasets to rerun the regressions and in different ways test for the robustness of the results.

I will briefly consider here only two papers analyzed by Rodriquez and Rodrik, which extend in developing trade policy measures. The first is by David Dollar (1992). The major contribution of Dollar is that he constructs two indices of outward orientation that as his analysis shows are negatively related to growth. These are the "index of real exchange rate distortion" and "index of real exchange rate variability". How these indices relate to outward orientation? Dollar explains it through sustained real exchange rates in favor of exporters (as means of protection), and relatively little variability in the exchange rates. Dollar regresses growth in per capita income on these indices. Besides theoretical criticism of Dollar's indices as appropriate measures of trade restrictions, Rodriquez and Rodrik question the robustness of regression results. When, for example, Rodriquez and Rodrik add initial per capita level and the level of education as explanatory variables, distortion index becomes statistically insignificant. With other specifications and updated database distortion index remains insignificant and in some instances has the wrong sign. The variability index, however, remains significant under all specifications.

Another study critiqued by Rodriquez and Rodrik is by Sachs and Warner (1995). These authors contribute to the empirical literature by constructing a zero-one dummy of openness, which takes the value of zero if the economy was closed according to any one of the following criteria: average tariff rates higher than 40%; non-tariff barriers cover on average more than 40% of imports; country operates under socialist economic system; state monopoly of major exports; black market premium exceeds 20% in the 1970s or 1980s.

Sachs and Warner find this openness index to be significant and positively related to growth rate after controlling for investment rate, government spending, secondary education, and number of revolutions. Rodriquez and Rodrik criticize that Sachs-Warner dummy derive its strength mainly from the combination of only two components: black market premium and monopoly exports. These components as argued by Rodriquez and Rodrik are not good measures of trade policy, because they can also serve as a proxy for many other variables unrelated to trade policy, such as macroeconomic and political distress in case of black market premium.

Summarizing the Rodriquez and Rodrik review, I would specifically highlight that they consider import duties and restrictiveness of non-tariff barriers to be the most appropriate measures of trade openness. However, they understand that simple tariff averages weighted by imports tend to underweight the restrictiveness of high tariffs due to the low volume of this kind of imports. Most of the authors of cross-country statistical analyses study much more than just the effects of trade policies. In most cases, along with trade barriers, monetary, fiscal, and regulatory policies are examined. However, according to Rodriguez and Rodrik, the main policy implications of such studies are that governments should dismantle their barriers to trade. And, though, many authors would disagree with Rodriguez and Rodrik on this, it is quite true that sometimes recommended changes in economic policies for developing countries are narrowed down to just lowering trade barriers.

After considering voluminous literature on the relationship between trade openness and growth I am still puzzled by the question: *So why there is still controversy on this matter after such an extensive amount of studies undertaken?* As it appears, partial explanation comes from different approaches to trade openness undertaken by different authors. But the main reason, I believe, emerges from complex interrelated links between different government policies and various macroeconomic variables. After all, as Rodriguez and Rodrik argue, there is not much sense in investigating the empirical relationship between trade and growth in view of these complex interrelationships. Taking into consideration this view, in this work I do not examine trade and growth relationship per se, but investigate the question how economic conditions in trading partners influence domestic growth.

This question is relatively unexplored in growth-openness literature. Clemens and Williamson (2004) were the first to include growth of trading partners in a growth regression, using historical data for the period 1869-1999 for 35 countries. The estimate turned to be insignificant in both economic and statistical terms, which was a surprising result to authors.

The honor of second attempt belongs to Arora and Vamvakidis (2004). The focus of their work is how much economic conditions (economic growth and income level) in trading partners matter for growth. They focus on a more recent period of 1960-1999, which allows for the inclusion of considerably larger number of countries. The results they obtain suggest that a country's growth is positively associated with both the growth rate and relative income of its trading partners. However, this empirical paper has no theoretical model underlying it, as well as theoretical explanations of the results obtained. Another shortcoming of their work is the potential endogeneity problem neglected. The authors use fixed effects estimator justified by Hausman test. However, they do not address the potential problem of endogeneity with respect to investment. It is reasonable to suppose that the rate of investment in physical capital, one of the explanatory variables included in their regression equation, is determined simultaneously with the rate of growth, thus creating the endogeneity problem. The authors address potential causality problem but only with respect to growth in trading partners. They argue that the results are robust to estimation using instrumental variables (for trading partners growth), however, do not include in this IV regression one of the primary-interest variables – relative GDP.

In conclusion, taking into account that potential causality problem with respect to investment has been neglected, the results presented can be questioned. Fixed-effects estimator does not account for endogeneity, therefore such estimation can lead to biased and even inconsistent estimates.

Chapter 3

THEORETICAL FRAMEWORK

Following the discussion on the theoretical framework of previous chapter, in this chapter I summarize channels through which trade can affect growth and consider several theoretical models.

First, trade increases market size and promotes specialization, which increases productivity and growth. This mechanism was first proposed by Adam Smith with the example of the pin factory.

Second, international exchange opens channels of communication that facilitate the diffusion of knowledge. Countries that trade in world markets learn about innovative products and new methods of production of existing goods much faster than isolated economies. Isolated country also might acquire such information, for example, by inspecting prototype products or reading professional journals, but direct participation in world markets accelerates a country's acquirement of foreign knowledge. This can be called a direct benefit from foreign stock of knowledge.

Third, the indirect benefits arise from imports of goods and services that have been developed by trading partners. While direct benefits assume only diffusion of knowledge with no interpenetration of product markets between countries, indirect benefits presuppose the opening of product markets.

Forth, international competition encourages entrepreneurs in each country to pursue new ideas and technologies. When a country enters world product markets, its entrepreneurs find their incentives to innovate affected by the market enlargement. Aggregate demand for domestic products increases as the market expands. However, there is an offsetting effect: the share of the market captured by any firm shrinks when the number of rival firms grow to include both foreign and domestic producers. Thus, the net result is ambiguous.

Fifth, trade alters supply and demand of goods, as well as relative prices; and the sectoral composition of production determines the overall rate of growth if different goods have different rates of technological progress. I will focus on the last channel.

The idea that trade composition matters for growth is the focus of several theoretical models. The conclusions of these models depend on the nature of technological progress and the structure of demand. Technological progress implies such forms as learning-by-doing, knowledge spillovers, learning-by-exporting. As to demand structure, historically, trade theory has used mainly homothetic demand functions.

For example, consider a model with one factor of production, two goods (computers and textiles, both produced with constant return to scale technology), and two countries (North and South). The two countries differ because they have different comparative advantages. North has comparative advantage in more sophisticated good – computers, and South has comparative advantage in textiles. Under the assumption of identical and homothetic demands, the South specializes in textiles and imports computers, while the North specializes in computers and imports textiles. Both countries benefit from trade because they exploit their comparative advantages. Under the assumption of technological progress through learning-by-doing in the computer industry, the North, which produces computers, will experience technological progress, whereas the South will not undergo any progress. Thus, it follows that trading with developing countries should lead to more technological progress than trading with developed countries.

The homothetic demand assumption in the model sketched above receives much criticism from Spilimbergo (2000). The author extends this model to a more than two goods case. He also assumes that preferences are not homothetic and that the proportion of income spent on computers increases with the level of income. His model predicts that trade with a less developed country improves welfare through the exploitation of comparative advantages but reduces technological progress in the long run. Thus, Spilimbergo illustrates a theoretical possibility that trading with less developed countries can lead to a technological slowdown, however, this theory has not been tested empirically.

Finally, I consider the work by Young (1991), which present a Ricardian model of trade among countries of different development. This model is interesting because it leads to the conclusion that trading with less developed countries is beneficial to growth, although in his model the demand is nonhomothetic. However, this is due to the assumption that the learning-by-doing and spillover effects are the same for all the advanced products.

Theoretical findings considered above evidence both positive and negative relationship between trade openness and economic growth. Different theoretical approaches are far from unanimity on the issue. Thus, theoretical advances in the area do not solve the ambiguity problem, so far leaving enough space for activity and possibly the honor of the final word to the empirical research.

As any model is only a rough approximation of reality, economists seek to test their theoretical findings by means of empirical research. Therefore, in this work the primary importance will be given to empirical research.

Chapter 4

METHODOLOGY AND DATA

It is first essential to give precise specification of the model. My growth regression has the following form:

$$\textbf{(Real GDP per capita growth)}_{it} = \mathbf{c}_i + \mathbf{g}\mathbf{X}_{it} + \mathbf{b}\mathbf{X}_{it}*\mathbf{D}_i + \mathbf{u}_{it},$$

for country i = 1,…, n

The dependent variable is per capita real GDP growth rate; $\mathbf{c}_i$ is the matrix of constant terms for each country i; **g** and **b** are the matrices of parameters to be estimated and $\mathbf{u}_{it}$ is the error term. $\mathbf{X}_{it}$ is the matrix of independent variables, $\mathbf{D}_i$ the dummy variable for transition economies. The composite term $\mathbf{X}_{it}*\mathbf{D}_i$ is introduced for the purpose of separating the effect of $\mathbf{X}_{it}$ on dependent variable for transition economies. Thus, the sum of parameters (**g**+**b**) is the effect on transition economies, whereas **g** alone shows the effect of $\mathbf{X}_{it}$ on non-transition countries. The sum (**g**+**b**) is of primary interest in my research work. Such model specification is advantageous in two respects: it allows to draw conclusions specifically for transition economies and it is also comparable to the study by Arora and Vamvakidis (2004) through the **g** matrix of parameters.

Now I define my explanatory variables, that matrix $\mathbf{X}_{it}$ includes.

First, I define the variables of primary interest. These are trading partners' real per capita GDP growth and the ratio of domestic real per capita GDP to trading partners' real per capita GDP. I construct these variables as trade weighted average, therefore, first, I need to determine trading partners for each country in the sample throughout the time-period used. For that purpose I use bilateral trade dataset of Rose which is borrowed from his website (http://faculty.haas.berkeley.edu/arose/RecRes.htm#Trade). The advantage of using this data is that it allows to reflect evolving trade patterns, as opposed to alternative fixed-period weights. Having these data, next I compute trade weights. Trade weights estimated on the basis of bilateral trade will reflect both import and export effects on growth. Arora and Vamvakidis use export weights, the share of each trading partner in the country's total exports, thus the imports are neglected. However, as both theory and empirical work (Coe and Helpman, 1995) evidence foreign stock of knowledge affects the country's productivity through imports (indirect effect). In fact, Coe and Helpman (1995) in their study on the link of country's total factor productivity and foreign R&D capital stock construct foreign R&D capital stocks using import weighted sums of trade partners' R&D spending.

Next, the initial level of GDP per capita is included consistently in endogenous growth theory to capture the possibility of a convergence effect. The sign of its coefficient is theoretically expected to be negative, since economies with lower levels of per capita income will tend to grow faster in per capita terms (Barro, Sala-i-Martin, 1995). For annual data in this work the initial level of GDP will be just previous year observation. For averaged data the GDP of the first year in each period is used.

Investment in human capital is also included as an explanatory variable. Secondary school enrolment is widely used as a proxy for investment human capital. However, as noted by Temple (1999), there are some conceptual difficulties with the use of school enrolment data, because these rates, in fact, rarely correspond to the human capital characterized in theoretical models. But due to data limitations school enrolment ratios will be used in this work as a proxy for human capital in annual data setting. For averaged data model specification average years of schooling in the population aged 15 and over borrowed from Barro's dataset will be used as a proxy.

Next explanatory variable is investment in physical capital. It can be proxied by the rate of change in domestic capital, i.e. by the share of domestic investment in GDP. In this work the share of gross capital formation in GDP will be used as a proxy.

Trade openness is used as additional variable to determine whether more open economies benefit from trade more. The share of external trade in GDP will be used as a proxy for trade openness measure. Although it has a number of drawbacks discussed in the empirical part of literature review, it is one of the most broadly used measures of openness in the literature and among the most robust (Levine and Renelt, 1992). One of its advantages is that it varies over time.

To control for global trends, time dummies are included.

The data on macroeconomic variables are obtained from international statistics, primarily from World Development Indicators (World Bank).

I work with panel data for 115 countries, out of which 25 are transition economies, 24 developed countries, and 66 developing, over the period of 1990-2000. Taking into consideration limited time-series variance, I use annual data. However, as averaged data tends to be less volatile, I also construct three-year averaged observations in order to see the long-run effects (relatively long) and carry on the analysis with averaged data. Summary statistics for my data are presented in the Appendices.

All data in the sample across all time periods and countries presents an unbalanced panel. Recently the use of panel data rather than cross-section or time series estimations became very popular due to numerous advantages that these technique offer. Some of them will be mentioned here.

Panel data allows to control for omitted variables that are persistent over time. Many variables exist on a country-to country basis, which may in one way or another affect economic growth. Since my sample contains different categories of economies, clearly, there exist huge differences that distinguish them. Country-specific characteristics are impossible to capture in a singe econometric equation. However, their omission may lead to bias in estimation. Thus, panel data allows to overcome problems of what would be biased estimates. Panel data is also considered to be more informative, as it creates more variability when combining cross-section variation with variation over time (Kennedy, 1998). This rises the efficiency of estimates, since more information is used in estimation.

However, limitations of using panel data also exist. One of them concerns data collection and, related to it, measurement errors. Constructing a balanced panel is a potential concern in the regressions. Also, heteroscedasticity is often found in the panel data. Nevertheless, the advantages discussed above justify and outweigh the limitations of using panel data.

The use of panel data, however, needs to be justified by certain statistical tests. Decision has to be made regarding panel data versus simple OLS on pooled data estimation. Two tests need to be run here. F-test can be applied after doing fixed-effects, and Breusch and Pagan LM test applied after carrying out random effects estimation. If both tests suggest that panel estimation should be preferred, the choice has to be made between fixed-effects and random-effects estimation. Hausman test will determine whether the preference should be given to fixed-effects or random effects. In fact, fixed-effects estimator is used by Arora and Vamvakidis. However, authors do not mention testing data for very possible heteroscedasticity and potential endogeneity problem. Since I work with unbalanced panel, heteroscedasticity may be very reasonably suspected in the data. Cook-Weisberg test will be appropriate in this respect. Moreover, there could be another problem, which fixed-effects does not account for. As Caselli et al. (1996) note it is reasonable to suppose that the rate of investment in physical capital is determined simultaneously with the rate of growth, thus creating the endogeneity problem. Grossman and Helpman (1991) also point out to the unclearness with causation. As they argue, capital accumulation might occur in response to knowledge accumulation, when technological innovations raise the marginal productivity of capital and so make investment in machinery and equipment more profitable. Another variable that could be suspected endogenous in my regression is trading partners GDP growth. Thus, I need to account for these potential endogeneity problems in my analysis. Wu-Hausman test for endogeneity will answer this question, and if endogeneity is indeed present, instrumental variables estimation will be used.

Chapter 5

EMPIRICAL ESTIMATION AND RESULTS

This section presents the results of empirical estimation of the effect of trading partners' economic conditions on growth.

I am interested in two basic model specifications. Both of them consist of the variables discussed in Chapter 4 including composite term with a dummy variable for transition countries. For the first model specification I use annual data. For the second model specification I use 3-year (namely: two 3-year periods and one 4-year period) averaged data, since averaged data is less volatile than annual.

5.1 Estimation Procedures

Several steps had to be taken before final estimation results. First of all, it was necessary to compute trade weights which are used to construct weighted average growth rates and income levels of each country's trading partners. In my analysis I use mean bilateral trade weights, which is an average of imports and exports. These weights are not fixed-period, they change annually, which allows to reflect evolving trade patterns. Thus, the primary-interest variables in my analysis were constructed on the basis of mean bilateral trade weights. Since the data on bilateral trade is available only up to the year 2000, the estimation was restricted to the period 1990-2000. Limited time-period was not the only concern regarding trade data. Ideally, I should have used separate data on exports and imports and construct two different weighted averages, one based on import weights and the other - on export weights. That way I could detach the effects of exports and imports on growth. However, due to data limitations (dataset available to me contains only average trade figures, no separate data for exports and imports) my analysis is restricted to overall effect of imports and exports together.

Apart from constructing my most important variables, I had to decide upon methodology used for each of the model specifications. Estimation of both model specifications followed virtually the same pattern up to some point, therefore it can be conveniently outlined here in the following steps.

Step 1. Despite the numerous advantages of the use of panel data, discussed in Chapter 4, the estimation of the panel requires certain statistical justification. Thus, the estimation starts with performing several tests, which allow to decide whether fixed effects, random effects, or simple OLS on pooled data should be preferred.

First, I look at panel versus simple OLS on pooled data estimation. Since I suspect country-specific effects in my data, I perform fixed-effects, and the F-test applied after carrying out the fixed-effects estimation answers the question of fixed-effects vs. pooled OLS. The null hypothesis is that the coefficients of the dummy variable intercept estimates are identical. If the computed test statistic (F) exceeds its critical value, then we reject the null and give preference to panel estimation. All the results of the tests discussed here are presented in the tables below according to model specification. For all model specifications p-value is zero, so the null hypothesis is rejected and preference is given to fixed effects at this stage.

Step 2. Second, since F-test suggests that panel estimation should be preferred, the Hausman specification test is applied to discriminate between fixed and random effects estimation of the panel data. When individual effects are present, unlike the fixed effect estimator, the random effects estimator may be biased. Whereas in fixed effects estimation different intercept are explicitly assigned via dummy variables, with random effects the different intercepts are not explicitly accounted for and are incorporated into the composite error term (Kennedy, 1998). The Hausman test determines whether there is correlation between this composite error term and explanatory variables, that is, whether the bias created by random estimation is so "large" that it prohibits the use of random effects procedure. Under the null, there is no correlation between error and explanatory variables, and thus, if the null is rejected, one should proceed with fixed effects estimation. For all model specifications the null is rejected, p-values equal zero, which suggests that preference should be given to fixed-effects estimation.

Step 3. Since my dataset represents an unbalanced panel, heteroscedasticity may very reasonably be suspected. To answer this question, I run Cook-Weisberg test. To be able to apply this test in Stata, I run LSDV (Least Squares Dummy Variable Regression), which is equivalent to fixed-effects estimation. The null hypothesis of constant variance is rejected for both model specifications, which means I need to apply LSDV estimation with robust standard errors for model specification with annual data as well as averaged data.

Step 4. But this is not the end of the story. Since I suspect endogeneity of my investment variable and trading partners' growth variable, I should consider applying instrumental variables (IV) estimation. In the presence of endogeneity, independent variables are contemporaneously correlated with the disturbance term, which means that the estimates of their coefficients will be biased even asymptotically. One way to solve this problem is to use instrumental variables estimation. In order to do so, it is necessary to find an instrument for the regressor which is endogenous. The instrument must be a variable with two properties: it must be uncorrelated with the error and highly correlated with the endogenous explanatory variable. While the second requirement can be tested, the first requirement cannot be tested because it involves a correlation between the instrumental variable and an unobserved error. But this is the case when we use only one instrumental variable, when we have more than one IV, we can effectively test whether some of them are uncorrelated with the structural error (Wooldridge, 2003). In my IV estimation of model specification 1 I use two instruments for investment: one-period lagged and two-period lagged investment and one instrument for trading partners' growth: one-period lagged value. These instruments have the highest correlation (among those available) with the instrumented variables. First of all, I consider possible endogeneity of investment. Since I can perform IV estimation using one IV, let it be one-period lagged investment. Thus, I do so, and given the IV estimates, compute the residuals. Because two-period lagged IV is not used in the estimation at all, we can check whether two-period lagged investment and computed residuals are correlated in the sample. If they are it is not a valid IV for investment. Of course, this tells nothing about the correlation between one-period lagged investment and error, in fact, for this to be a useful test, we have to assume that one-period lagged IV and error are uncorrelated. The roles of the two chosen IV can be reversed, and we can test whether one-period IV is correlated with error. In fact, our test choice does not matter; nevertheless we have to assume that at least one IV is exogenous. Thus, having assumed that one-period lag is exogenous, I check for correlation between two-period IV and error, and find the correlation to be equal to -0.0376. Next since I use more than one IV, I should also test the overidentifying restrictions. The number of overidentifying restrictions is simply the number of extra instrumental variables. In my case there is one overidentifying restriction. To perform overidentification test I use Sargan statistic. The hypothesis being tested with the Sargan test is that the instrumental variables are uncorrelated to some set of residuals, and therefore they are acceptable instruments. If the null hypothesis is confirmed statistically (that is, not rejected), the instruments pass the test; they are valid by this criterion. Thus, my instruments pass Sargan test, and I use both of them to instrument investment.

Step 5. It is important to note that the instrumental variable technique is not always a perfect remedy for the endogeneity problem. Although the estimates obtained through using the IV procedure are consistent, there is a price to pay for avoiding the asymptotic bias of OLS: the variance-covariance matrix of the IV estimator is larger than that of the OLS estimator. Thus, the final step is to run Hausman endogeneity test which allows to see whether the use of IV estimation is justified, whether it, indeed, should be preferred to simple fixed-effects estimation. The null hypothesis of the test is that the difference in coefficients obtained via two types of estimation is not systematic. After running Hausman test for all model specifications and for both questionably endogenous variables, the results I receive are the following. Only for model specification 1 and only for instrumented investment, the null is rejected, and thus the use of IV procedure is justified. For other model specifications and for instrumented trading partners' growth, however, fixed-effects estimation is justified.

5.2 Discussion of the Results

Now, after carrying out all appropriate tests and estimations, we can turn to the discussion and interpretations of the obtained results.

First, referring to model specification 1 (Table 1)[1], which involves estimation of growth regression using annual data. Column 1 shows the results of fixed-effects estimation, Column 2 – the results of LSDV estimation with robust standard errors. The results for these two estimations are similar: almost all variables are significant and have theoretically expected signs, except for trade share in GDP,

[1] Tables 1 and 2 with results are presented at the end of this chapter.

which is insignificant. Variables of interest, trading partners' GDP growth and ratio of GDP to trading partners' GDP, are statistically significant and have positive signs. The positive sign of the former is consistent with the results obtained by Arora and Vamvakidis (2004), whereas the sign of the latter is the opposite to what these authors have found. The opposite results could be explained by different weights used for constructing trading partners' growth rates and income levels. Arora and Vamvakidis use export weights, whereas I use mean bilateral trade weights (average of exports and imports). But I will discuss this aspect in more detail in the next chapter, where I present conclusions. As to composite terms with transition dummy, these variables turn out to be insignificant. This means that there is no difference in effect of trading partners' growth on domestic GDP growth for transition economies and the rest of countries, as well as there is no difference in effect of relative GDP on domestic GDP growth for countries in transition. When interpreting these results, we should bear in mind the measurement units of the variables. The dependent variable, growth, was measured in percent, while explanatory variables were measured as ratios to the GDP level, except for trading partners' GDP, which was also measured in percent. Thus, higher growth in a country's trading partners' by 1 percent is correlated with higher domestic growth by as much as 1.3 percent. While, a fall in trading partner GDP that increases the ratio of domestic to foreign GDP by 1 percentage point is correlated with an increase in domestic growth by 0.12 percentage points. The sign of initial GDP variable is negative, as expected, indicating the convergence effect. Human capital and investment are both significant and indicate positive effects on growth. Trade as a share of GDP is insignificant with fixed-effects estimation and LSDV with robust standard errors estimation, however, it turns marginally significant at 5% or certainly significant at 10% in the next column, which shows IV estimation results. However, we need to bear in mind that in presence of endogeneity fixed-effects estimation could give biased and, what is worse, inconsistent estimates.

Column 3 suggests more reliable estimates, as it shows IV estimation results. All the variables keep the same sign and are quantitatively very close to those obtained in Columns 1 and 2. Composite terms with transition dummy remain insignificant. As mentioned above, trade turns significant, indicating positive effect on growth, and becomes quantitatively larger. The variables of interest do not change much, trading partners' growth coefficient remains practically the same (1.3), relative GDP coefficient falls to 9.88, now indicating 0.099 percentage points increase in growth which is correlated with a relative GDP increase by 1 percentage point.

To check for robustness of these results I run IV regression on pooled OLS[1], and find that one of the variables of interest changes its sign to negative, it is the ratio of domestic to foreign GDP. This result is consistent with that obtained by Arora and Vamvakidis (2004), however they used fixed-effects estimation. I am going further and perform a between estimation. The results as expected are consistent with pooled OLS. Though, practically all the variables are insignificant, their signs are as in pooled OLS estimation. The explanation is simple: pooled OLS is a combination of the fixed-effects estimator (within estimator) and between estimator (Greene, 2000). When explanatory variables do not vary very much over individuals relative to the variation over time within individuals, OLS estimate is close to the within estimate. When the opposite is true, OLS is close to the between estimate. It is thus possible to have opposite signs for between and within regressions. In my case, X's vary over countries more relative to variation over time, and it can be easily explained by a large heterogenous sample that I use in my analysis and a relatively short time-period. Nonetheless, the use of fixed-effects is justified by the two tests, results of which

[1] The results of pooled OLS and between estimations are given in Appendices.

are given in the tables below, therefore one should hold to fixed-effects estimation results. The only thing that I should emphasize in this respect is that the results (more specifically one of the interest variables) are not robust if the regression excludes the fixed effects.

What should be noted, however, is that signs and significance of coefficients are robust to the inclusion of time dummies, which suggests that trading partners have an impact on growth that goes beyond common trend effects.

For Model Specification 2 (Table 2) averaged data is used, since it tends to be less volatile and therefore more theoretically correct when estimating long-term effects. However, the price to be paid for less volatility is a substantial decrease in the number of observations. Model 2 is first estimated by fixed-effects. Though, having detected heteroscedasticity in averaged data as well, I perform LSDV with robust standard errors estimation. When addressing the possible endogeneity of investment and trading partners' growth specification tests provide no evidence of bias if both of these variables are treated as exogenous. Thus, IV estimation is of no need for this model specification. In Column 1 I present the results of fixed-effects estimation, in Column 2 LSDV with robust standard errors estimation. Both regressions give similar results, however with some exceptions. Thus, with fixed-effects estimation relative GDP variable is insignificant, whereas in Column 2 with robust standard errors estimation it turns significant and is quantitatively close to the estimate obtained for annual data. Comparing the results of averaged data to annual data estimation, I should note that trading partners' growth effect is a bit larger, whereas relative income slightly smaller for averaged data model. Thus, for averaged data higher growth in a country's trading partners' by 1 percent is correlated with higher domestic growth by 1.47 percent. And an increase in relative GDP by 1 percentage point is correlated with an increase in domestic growth by 0.089 percentage points.

Trade variable turns its sign to negative, though it is insignificant in both estimations with averaged data. An interesting observation is the negative sign of the interaction term of relative GDP with transition dummy (however, it is insignificant), which in Model 1 was consistently positive. Just as for Model 1, I consider OLS estimation and between estimation to check for robustness[1]. Pooled OLS and between estimation surprisingly show strong significance of interaction terms with transition dummies, while the variables trading partners' growth and relative GDP are insignificant by themselves. This indicates the significance for transition countries, but no significant effects for non-transition countries. However, pooled OLS and between estimation results are produced here only for the reason of robustness check, therefore should not be viewed as indicative for this work.

Summing up, I should draw a distinction between the two models in regard to results reliability. Model specification 1 could be considered more reliable in terms of larger number of observations. Whereas, model specification 2 is more correct theoretically, since it tries to reveal long-term effects, but at the same time it implies less precision due to considerably smaller number of observations.

[1] As pooled OLS and between estimations are not justified by the tests and their results should not be given sizeable consideration, I present them in the Appendices.

Table 1. Model Specification 1. Annual data.

Independent Variable	Fixed-effects Panel Regression	LSDV robust	IV fixed-effects
Ln (initial GDP per capita)	-22.01054 (0.000)*	-22.01054 (0.000)*	-21.46734 (0.000)*
Secondary school enrollment	.0509186 (0.002)*	.0509186 (0.001)*	.0410223 (0.021)*
Investment/GDP	.2600811 (0.000)*	.2600811 (0.000)*	.1557834 (0.027)*
Trading partners' GDP growth	1.335643 (0.000)*	1.335643 (0.000)*	1.324601 (0.000)*
Ratio of domestic GDP to trading partners' GDP	12.26405 (0.002)*	12.26405 (0.000)*	9.880387 (0.015)*
Trade/GDP	.0090726 (0.389)	.0090726 (0.569)	.0217765 (0.056)
TransitionDummy*Trading partners' GDP growth	.1845312 (0.305)	.1845312 (0.362)	.043296 (0.808)
TransitionDummy*Relative GDP	32.39654 (0.051)	32.39654 (0.152)	19.46501 (0.310)
Number of Observations	949		833
R^2	within=.4306 betw= .0004 overall =.003	R^2= 0.6697	within=.402 betw=.0596 overall=.007

F test that all u_i=0: F(115, 825) = 8.43 Prob > F = 0.0000
Hausman specification test: χ2(8) = 192.78; P-value: 0.000
Cook-Weisberg test for heteroscedasticity: χ2(1) = 41.78; P-value: 0.00
Hausman test for investment: χ2(8) = 89.74; P-value: 0.000
Hausman test for trading partners' growth: χ2(8) = 3.31; P-value: 0.9136
Test of overidentifying restrictions: 3.17 Chi-sq(1) P-value = 0.0750

*Note: p-values in parentheses; * - significance at 5%*

Table 2. Model Specification 2. Averaged data.

Independent Variable	Fixed-effects Panel Regression	LSDV robust
Ln (initial GDP per capita)	-14.9283 (0.000)*	-14.9283 (0.000)*
Average years of schooling	1.152227 (0.090)	1.152227 (0.197)
Investment/GDP	.2727481 (0.000)*	.2727481 (0.000)*
Trading partners' GDP growth	1.473823 (0.000)*	1.473823 (0.000)*
Ratio of domestic GDP to trading partners' GDP	8.938185 (0.123)	8.938185 (0.043)*
Trade/GDP	-.0089893 (0.560)	-.0102376 (0.075)
TransitionDummy*Trading partners' GDP growth	.2618176 (0.470)	.2618176 (0.563)
TransitionDummy*Relative GDP	-5.985802 (0.378)	-5.985802 (0.224)
Number of Observations	281	281
R^2	within= .659 betw=.0099 overall=.003	R^2= 0.8335
F test that all u_i=0: F(106, 166) = 3.80 Prob > F = 0.0000		
Hausman specification test: $\chi 2(8)$ = 112.86; P-value: 0.000		
Cook-Weisberg test for heteroscedasticity: $\chi 2(1)$ = 144.11; P-value: 0.00		
Hausman test for investment: $\chi 2(8)$ = 2.49; P-value: 0.9621		

*Note: p-values in parentheses; * - significance at 5%*

Chapter 6

CONCLUSIONS AND PROPOSITIONS FOR FURTHER RESEARCH

As opposed to the vast majority of trade and growth literature, this paper looks at the issue from the new perspective. The main question is whether economic conditions in country's trading partners matter for its growth. More specifically, the paper examines how trading partners' growth and income levels affect country's growth. In contribution to the similar study, my analysis is extended for transition economies case and also incorporates new approach in data construction.

My results show positive growth effect and positive relative income effect. Positive growth effect implies that trading with faster growing countries is beneficial for domestic growth. Positive relative income effect predicts that developed economy benefits from trading with a relatively poorer country. The latter effect is in contradiction with what Arora and Vamvakidis (2004) find, namely the negative relative income effect. The possible reason for this puzzling finding could be the fact that Arora and Vamvakidis use export weights for constructing trade-weighted average growth rates and income levels in their analysis, whereas I use bilateral trade weights (average of exports and imports). Thus, my data accounts for both export and import effects. Import effect here implies the effect of import-weighted primary-interest variables on growth, and export effect – export-weighted variables. However, these effects are inseparable in my analysis due to unavailability of separate data. Therefore, hypothetically import effect might outweigh export effect, and the overall relative income effect turns positive, if import effect is assumed to be positive.

In such case one explanation based on positive import effect assumption could be the following. When a rich country imports from less developed economies, the goods imported are very likely to be less sophisticated, with a low degree of processing, thus allowing the rich country to allocate relatively more resources to the domestic production of more sophisticated goods and to their continuous improvement. If we assume that there is a technological progress through learning-by-doing in the more sophisticated industry, rich country will undergo a technological progress. Less developed economies tend to import more sophisticated goods from advanced nations. If there are no learning-by-doing effects or they are considerably less in traditional (less sophisticated) good industry, poorer country does not experience technological progress. These implications are in line with the trade composition two-good model considered previously in Chapter 3. Although, the conclusions of that model were criticized by Spilimbergo (2000) on the basis of unrealistic assumptions and the lack of empirical support, this criticism is arguable. In particular, this work can be considered as an argument in favour of the model, as it provides the empirical support: one of the main results of my thesis predict that trading with less developed country is beneficial for growth.

Another plausible story explaining the empirical results could be that poor countries sell their natural resources to richer countries and do not develop their industries, whereas rich countries benefit from such trade because they can exploit poor countries by buying cheaply their natural resources. The latter is in line with positive import effect hypothesis mentioned above: importing from less developed country increases growth.

No less important finding of my thesis is that there is no evidence for different effects of trading partners' growth and relative GDP for transition economies, since interaction terms with transition dummies are insignificant throughout different specifications. Therefore the same theoretical explanation as given above could be applied to transition countries. For example, Russia is now growing not because it undertook reconstruction of its obsolete industries but because it massively exports natural resources.

However, the hypothesis of positive import effect formulated above remains just a hypothesis, which could be tested given the separate data on imports and exports series of each country. Thus, for further research I would suggest including in the analysis separate import- and export-weighted variables. For this analysis I would propose as well using at least 5-year averaged data and for a longer period of time. Since this work found no difference for transition countries, they can be excluded from the sample and longer-period historical data used for the rest of the countries.

BIBLIOGRAPHY

Arora, Vivek and Vamvakidis, Athanasios (2004) How Much Do Trading Partners Matter for Economic Growth? IMF Working paper WP/04/26

Aghion, Philippe and Howitt, Peter (1992) A Model of Growth through Creative Destruction, Econometrica 60, 2 (March)

Aghion, Philippe and Howitt, Peter (1998) "Endogenous Growth Theory", Cambridge, Massachusetts: The MIT Press

Balassa, Bela (1971), The Structure of Protection in Developing Countries, Baltimore: The John Hopkins Press.

Balassa, Bela (1982) Development Strategies in Semi-Industrial Countries, Oxford: Oxford University Press.

Baldwin, Robert (2003) Openness and Growth: What's the Empirical Relationship? NBER Working paper 9578

Barro, Robert and Sala-i-Martin, Xavier (1995) "Economic Growth," New York: McGraw Hill

Ben-David, Dan (1993) Equalizing Exchange: Trade Liberalization and Income Convergence, The Quarterly Journal of Economics, 108, 653-679.

Caselli, Francesco, Gerardo Esquivel and Fernando Lefort (1996) Reopening the Convergence Debate: A New Look at Cross-Country Growth Empirics. Journal of Economic Growth

Clemens, Michael and Jeffrey Williamson (2004) Why did the Tariff-Growth Correlation Reverse after 1950? Journal of Economic Growth, Vol. 9, 1.

Coe, David and Helpman, Elhanan (1995) International R&D spillovers, European Economic Review, 39

Dollar, David (1992) Outward-oriented Developing Economies Really Do Grow More Rapidly: Evidence from 95 LDCs, 1976-85, Economic Development and Cultural Change.

Economist, The (2002) United We Fall, September 26

Edwards, Sebastian (1993) Openness, Trade Liberalization, and Growth in Developing Countries, Journal of Economic Literature, XXXI

Edwards, Sebastian (1993) Openness, Productivity and Growth: What do we really know? Economic Journal 108, March 1998, 383-98.

Greene, W.H. (2000) Econometric Analysis, Prentice Hall, New Jersey.

Grossman, Jene and Elhanan Helpman (1991) Innovation and Growth in the Global Economy, Cambridge, Massachusetts: The MIT Press

Gros, Daniel and Alfred Steinherr (2004) Economic Transition in Central and Eastern Europe, Cambridge University Press, Cambridge, UK

Kennedy, Peter (1998) A Guide to Econometrics. The MIT press.

Krueger, Anne (1978) Foreign Trade Regimes and Economic Development: Liberalization Attempts and Consequences, Cambridge, MA: Ballinger Pub. Co. for NBER.

Levine, Ross, and David Renelt (1992) A Sensitivity Analysis of Cross-Country Growth Regressions, American Economic Review, September, 82, 942-63.

Little, Ian, Tibor Scitovsky and Maurice Scott (1970) Industry and Trade in Some Developing Countries: A Comparative Study, Cambridge: Oxford University Press.

Lucas, Robert E. (1988) On the Mechanics of Economic Development, Journal of Monetary Economics, 22

Prebisch, Raul (1950) The Economic Development of Latin America and Its Principal Problems, NY: United Nations.

Ramsey, Frank (1928) A Mathematical Theory of Savings, The Economic Journal, 38, 543-59.

Rodriguez, Francisco and Rodrik, Dani (1999) Trade Policy and Economic Growth: A Skeptic's Guide to the Cross-National Evidence, NBER Working paper 7081

Romer, Paul M. (1986) Increasing Returns and Long-run Growth, Journal of Political Economy, 94.

Romer, Paul M. (1990) Endogenous Technological Change, Journal of Political Economy, 98.

Sachs, Jeffrey and Andrew Warner (1995) Economic Reform and the Process of Global Integration, Brooking Papers on Economic Activity.

Singer, Hans (1950) The Distribution of Gains between Investing and

Borrowing Countries, American Economic Review, 40, 473-85.

Solow, Robert (1956) A Contribution to the Theory of Economic Growth, Quarterly Journal of Economics, 70: 65-94.

Spilimbergo, Antonio (2000) Growth and Trade: The North Can Lose, Journal of Economic Growth, 5: 131-146

Temple Jonathan (1999) The New Growth Evidence Journal of Economic Literature. Vol. XXXVII. March, pp. 112-156

Wooldridge, Jeffrey (2003) Introductory Econometrics, Michigan State University

Young, Alwyn (1991) Learning by Doing and the Dynamic Effects of International Trade, Quartely Journal of Economics, 106

APPENDICES

Appendix A. Summary Statistics

Variable	Number of Observations	Mean	Standard Deviation	Min	Max
Growth	1065	1.204648	6.163892	-44.35	79.71
Ln (initial GDP per capita)	949	7.765491	1.590142	4.814435	10.73535
Secondary school enrollment	1065	67.18992	34.34587	6.408337	160.699
Investment/GDP	1065	21.61581	6.857277	1.631258	59.77071
Trading partners' GDP growth	1065	1.604146	1.766473	-11.12993	8.230382
Ratio of domestic GDP to trading partners' GDP	1065	.3556828	.5073193	.0051089	2.804857
Trade/GDP	1065	72.29079	37.51175	13.75305	282.4015
TransitionDummy* Trading partners' GDP growth	1065	.1020505	1.479335	-11.12993	8.230382
TransitionDummy* Relative GDP	1065	.0271095	.0695609	0	.5073956

Apendix B. Model Specification 1. Pooled OLS and Between Estimation.

Independent Variable	IV fixed-effects	IV Pooled OLS	IV between-effects
Ln (initial GDP per capita)	-21.46734 (0.000)*	.1468895 (0.487)	.2609 (0.472)
Secondary school enrollment	.0410223 (0.021)*	.0151015 (0.051)	.01649 (0.230)
Investment/GDP	.1557834 (0.027)*	.0927491 (0.001)*	.13682 (0.003)*
Trading partners' GDP growth	1.324601 (0.000)*	.8852234 (0.000)*	.641715 (0.127)
Ratio of domestic GDP to trading partners' GDP	9.880387 (0.015)*	-.8986794 (0.076)	-1.17159 (0.182)
Trade/GDP	.0217765 (0.056)	.0043211 (0.311)	.000277 (0.969)
TransitionDummy*Trading partners' GDP growth	.043296 (0.808)	.4681016 (0.009)*	.685135 (0.181)
TransitionDummy*Relative GDP	19.46501 (0.310)	-3.838329 (0.148)	-6.25719 (0.224)
Number of Observations	833	833	833
R^2	within=.402 betw=.0596 overall=.007	R^2= 0.2580	within=.235 betw=.3133 overall= .266

*Note: p-values in parentheses; * - significance at 5%*

Appendix C. Model Specification 2. Pooled OLS and Between Estimation.

Independent Variable	LSDV robust	Pooled OLS robust	Between-effects
Ln (initial GDP per capita)	-14.9283 (0.000)*	.2134751 (0.500)	.2857599 (0.537)
Average years of schooling	1.152227 (0.197)	-.0941832 (0.418)	-.1468732 (0.470)
Investment/GDP	.2727481 (0.000)*	.2103371 (0.000)*	.2768812 (0.000)*
Trading partners' GDP growth	1.473823 (0.000)*	1.166762 (0.000)*	.6698235 (0.369)
Ratio of domestic GDP to trading partners' GDP	8.938185 (0.043)*	.1125363 (0.888)	.2321234 (0.854)
Trade/GDP	-.0102376 (0.075)	.0016556 (0.791)	.0030407 (0.784)
TransitionDummy*Trading partners' GDP growth	.2618176 (0.563)	1.178439 (0.016)*	2.853812 (0.000)*
TransitionDummy*Relative GDP	-5.985802 (0.224)	-8.131765 (0.027)*	-15.01467 (0.002)*
Number of Observations	281	281	281
R^2	R^2= 0.8335	R^2= 0.4296	within=.404 betw=.448 overall=.41

*Note: p-values in parentheses; * - significance at 5%*

Appendix D. List of countries used in the analysis

Albania	Guyana	Russian Federation
Argentina	Honduras	Saudi Arabia
Armenia	Hungary	Senegal
Australia	Iceland	Sierra Leone
Austria	India	Slovak Republic
Azerbaijan	Indonesia	Slovenia
Bangladesh	Ireland	South Africa
Belarus	Israel	Spain
Belgium	Italy	Sweden
Benin	Jamaica	Switzerland
Bolivia	Japan	Syrian Arab Republic
Bosnia and Herzegovina	Jordan	Tajikistan
Brazil	Kazakhstan	Togo
Bulgaria	Kenya	Trinidad and Tobago
Burkina Faso	Korea, Rep.	Tunisia
Cameroon	Kyrgyz Republic	Turkey
Canada	Latvia	Uganda
Central African Republic	Lithuania	Ukraine
Chad	Macedonia, FYR	United Kingdom
Chile	Madagascar	United States
China	Malawi	Uruguay
Colombia	Malaysia	Uzbekistan
Congo, Dem. Rep.	Mali	Venezuela, RB
Costa Rica	Malta	Zambia
Cote d'Ivoire	Mauritania	Zimbabwe
Croatia	Mauritius	
Cyprus	Mexico	
Czech Republic	Moldova	
Denmark	Morocco	
Dominican Republic	Nepal	
Ecuador	Netherlands	
Egypt, Arab Rep.	New Zealand	
El Salvador	Nicaragua	
Estonia	Niger	
Fiji	Nigeria	
Finland	Norway	
France	Pakistan	
Gabon	Panama	
Gambia, The	Papua New Guinea	
Georgia	Paraguay	
Germany	Peru	
Ghana	Philippines	
Greece	Poland	
Guatemala	Portugal	
Guinea-Bissau	Romania	