TRADE AND CONVERGENCE: AN EVALUATION FOR TURKEY AND EU-15

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____

Prof. Dr. Meliha Altunēśk
Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Science of Economics.

Prof. Dr. Erdal Özmen
Head of Department

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science of Economics.

Assoc. Prof. Dr. Elif Akbostancē
Supervisor

Examining Committee Members

Prof. Dr. Erdal Özmen (METU, ECON)

Assoc. Prof. Dr. Elif Akbostancē (METU, ECON)

Assoc. Prof. Dr. Uĵ ur Soytaк (METU, BA)

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name, Last Name: GÖZDE ALKAN

Signature:

ABSTRACT

TRADE AND CONVERGENCE: AN EVALUATION FOR TURKEY AND EU-15

Alkan, Gözde
M.S., Department of Economics
Supervisor: Assist. Prof. Dr. Elif Akbostancē

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This thesis investigates the relation between trade and convergence for Turkey and EU-15 in the period 1980-2008. The countries and time period are selected because Turkey has intensive trade relation with EU-15, and these economies had experienced conversion in their economic structures and adopted liberal economic policies, as well as liberal trade policies in this period. Using panel data methods two equations are estimated; an income dispersion equation for the impact of bilateral trade on per capita income differences and a gravity model of trade for the impact of per capita income differences on bilateral trade. Overall findings of this study give strong evidence for the hypothesis that trade causes convergence, whereas weaker support for the thesis that convergence causes trade.

Keywords: Convergence, Gravity Model, International Trade, Turkey and EU-15, Panel Data

ÖZ

TİCARET VE YAKINSAMA: TÜRKİYE VE AB-15 İÇİN BİR DEĞERLENDİRME

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Bu çalışma, 1980-2008 döneminde Türkiye ile AB-15 arasında ticaret ve yakınsama ilişkisini incelemektedir. Bu ülkelerin ve dönemin seçilme nedeni, Türkiye'nin sözkonusu ülkelerle yoğun ticari ilişkisi bulunması ve anılan dönemde ülkelerin ekonomik yapılarında değişim yaşayarak liberal ekonomi ve ticaret politikaları uygulamış olmasıdır. Panel veri yöntemleri kullanılarak iki denklem tahmin edilmiştir: ikili ticaretin kişi başına gelir farkları üzerindeki etkisini incelemek için bir gelir dağılım denklemi ve kişi başına gelir farklarının ikili ticaret üzerindeki etkilisi incelemek için bir ticaret çekim modeli. Çalışmanın sonuçları ticaretin yakınsamaya yola açtığı hipotezine güçlü kanıt sağlarken, yakınsamanın ticarete yol açtığı tezine zayıf destek sunmaktadır.

Anahtar Kelimeler: Yakınsama, Çekim Modeli, Uluslararası Ticaret, Türkiye ve AB-15, Panel Veri

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CHAPTER I

INTRODUCTION

The relation between international trade and per capita income convergence is an important issue in trade theory. The relation has two directions. In one aspect, per capita income convergence may affect trade. In other aspect, trade may affect per capita income convergence. Convergence here refers to a fall in cross-country income differences.

For the former aspect, old trade theories such as Hecksher-Ohlin and Samuelson suggest that, differences ï in terms of factor endowments- drive trade. Whereas, new trade theories such as Linder (1961), Krugman (1980) and Helpman (1981) argue that, similarities in income between countries lead trade to enhance. For the latter one, although there are several studies such as Grossman and Helpman (1991) examining theoretical reasons of how trade can affect convergence, the link from trade to convergence is mainly studied empirically.

In this empirical literature, majority of the studies analyze the relationship between convergence and trade within a group of countries. There are also few studies such as Lee, Lim and Azali (2005) and Giles (2001) that concentrate on one country and search whether that country converge to a group of countries. However, the relationship between trade and convergence has not been studied for Turkey in the literature. The aim of this study is to investigate the relationship between trade and convergence for Turkey and European Union (EU)-15 for the period 1980-2008. Most of the EU-15 countries are major trading partners of Turkey, and average share of EU-15 in Turkeyôs total trade is about 45 per cent. Moreover, Turkey is a candidate for EU membership, and has a Customs Union (CU) with EU since 1996.

High degrees of economic integration between Turkey and EU have already been achieved due to the reforms and regulations that Turkey adopts in order to fulfill the requirements of full membership. The selected time period corresponds to the liberalization era that trade share in GDP has increased significantly for both Turkey and EU-15.

The literature in this area adopts either time-series or cross-section analysis. However, in order to control for individual heterogeneity, it is preferred to utilize panel data techniques in this study. The model applied is similar to Cyrusôs (2004) in specification. Two equations have been estimated; a dispersion equation for the impact of bilateral trade on per capita income differences and a gravity model for trade for the impact of per capita income differences on bilateral trade.

In income dispersion equation, the absolute value of the difference in the logarithm of per capita income of Turkey and the logarithm of per capita income of EU-15 countries has been regressed on the logarithm of bilateral trade volume (exports plus imports) between Turkey and EU-15 countries. Simply, if the estimated coefficient is significant with a negative sign, trade causes convergence. Hence, increasing trade between Turkey and EU-15 leads Turkey to converge EU-15 in terms of per capita income.

In trade equation, this time the logarithm of bilateral trade volume between Turkey and EU-15 countries has been regressed on the absolute value of the difference in the logarithm of per capita income of Turkey and the logarithm of per capita income of EU-15 countries. If the estimated coefficient is significant with a negative sign, convergence causes trade. Hence, when the income difference between Turkey and EU-15 decreases, bilateral trade volume between Turkey and EU-15 increase.

First, two equations have been estimated separately using Pooled Least Squares (PLS) estimation. Then, two equations have been estimated as a system and Instrumental Variables (IV) technique has been utilized.

Rest of the study is organized as follows: In chapter 2, literature on trade and convergence relation is examined; origins and evolutions of the idea, applications and results of different authors are represented. In chapter 3, the scope of the analysis and interpretation of the data are stated. Theoretical considerations and empirical model are explained in chapter 4. Then, empirical analysis and estimation results are denoted in chapter 5. Finally, the summary of concluding remarks of the paper is given.

CHAPTER II

LITERATURE ON CONVERGENCE HYPOTHESIS

In this chapter, general approaches in trade theory, which can be related to convergence are given in a fundamental frame, and the studies that directly consider ótrade and convergenceô theory, are taken into account in more detail.

The influence of international trade on economies is a subject that attracts interest since the seventeenth century and so much has been written in this literature. From the very first approaches to recent ones, all of them have something to say which we can somehow attach to convergence.

Going back to history, it is seen that the first considerations build international trade on differences between countries. Starting with Adam Smith, the main motivation behind trade is the difference between countriesô production costs. With Ricardo, diversification of production becomes possible but again the reason for trade is dissimilarity of productivities in different goods between countries. One of the articles which relates convergence with Ricardian findings is Abramovitz. The author argues that countries that are backward in the level of productivity have a potential for quick progress. So when the technological gap- therefore the productivity gap- between the leader and the follower country is larger then followerôs potential for growth in productivity is also more powerful which means that the follower will catch up the leader in the long run. Therefore, convergence occurs solely due to the technological backwardness if the social capabilities of the countries are sufficiently developed and their institutions are effective (Abramovitz, 1986). International trade system is one of these institutions that supports the process.

Heckscher and Ohlin, like the earlier theories of Smith and Ricardo, states that the differences -of factor endowments this time- drive trade. According to this theory, free trade and specification, which comes with it, raises the price of the abundant factor in that economy, while decreasing the price of the scarce factor and gives the motivation of convergence hypothesis. The proposal is: ñfree trade between the countries will drive factor prices towards equalityò which is subsequently formalized by Samuelson (1948) as the ñfactor price equalization theoremò. Under certain circumstances free trade will drive factor prices as well as commodity prices towards equality. However, Rassekh and Thompson state that the relation between factor price equalization -which they call micro convergence-, and per capita income equalization -which they call macro convergence-, is rarely noted in the literature. The authors argue that the factor price equalization and per capita incomes equalization are indeed separate issues. According to this study which considers both the static Heckscher-Ohlin trade model and the dynamic two-sector neoclassical model, factor price equalization is neither necessary nor sufficient to argue that per capita incomes among trading countries also tend to equalize (Rassekh and Thompson, 1998).

In some earlier empirical studies evidence for the standard theory of trade, which we mentioned above, were found. MacDougall (1953) and Balassa (1963) found that Ricardian Theory is supportable by evidence. On the other hand, Leontief (1954) discovered that empirical analysis for the US economy did not support Hechcker-Ohlin Theory. Afterwards, it is usually stated that these theories serve to explain the trade between developed economies, which are rich in capital goods, and developing economies, which are labour abundant, (inter-industry trade) but they cannot explain the trade between similar ï industrialized- economies that is mainly based on intra-industry trade.

In 1960s, new theories and hypothesis emerged to explain international trade patterns. Linder (1961) developed ñsimilarity in preferences theoremò. According to this theorem, countries which have similar preferences trade more. The theory is not only suitable to explain intra-industry trade, but moreover, the idea behind it is that these similar preferences come from similar income levels. With overlapping demands, countries which have similar income levels increase their trade relatively to other economies whereas differences in per capita incomes appears to be an obstacle to trade. Krugman (1980) and Helpman (1981) also explain intra-industry trade with models of economies of scale and monopolistic competition. They argue that countries with similar -even identical- factor endowments will engage in trade.

Beyond doubt, trade may affect the incomes of trading countries. But it is not so clear if income differences between trading countries increases or decreases with free trade. The way of interaction is not certain as well. While trade theories evolved over time, the perspectives on convergence also changed. Standard theory of trade gives the first impulses of the idea that trade causes convergence whereas Linderҫs theorem takes us to the opposite way: convergence causes trade.

In the neoclassical model of growth (Solow, 1956) on the other hand, convergence is predicted among similar countries even without trade. In Solowҫs model, convergence is associated to growth rates and initial incomes. Similar countries; countries with same saving rate, population growth rate, depreciation rate and same production function will converge to the same steady state level of per capita income and per capita capital stock in the long run. It means that the country with a lower per capita income and capital stock initially, will grow with a higher rate and will catch up the rich one in long term. Free trade is not the cause of this process but it may enhance it.

Ben-David and Loewy search for trade effects on convergence using an open economy version of Solowҫs neoclassical model. In this model knowledge is taken as a factor of production, and ñtrade between countries acts as a conduit for the dissemination of knowledgeò. Their conclusion departs from usual neoclassical findings in the way that openness to trade not only affects the output levels, but also has an impact on steady-state growth rates. If the economy is more open to international trade, it feels much more competitive pressures upon it and needs to implicate foreign knowledge into its production processes in order to be able to compete. Briefly, free trade between countries makes diffusion of knowledge easier which encourages the growth process. Similar to Solowôs model, countries with identical trade policies tend to converge to the same steady-state growth path in the long run. The difference of this case comes from the level effects and growth effects that occur at the same time (Ben-David and Loewy , 1997).

Lane also studies the linkage between trade and convergence using a ómodel of growth under credit constraints and in which international trade expands access to creditô. The author focuses on an additional channel linking international trade and convergence that operates under the positive effect of trade openness on a countryôs access to international capital markets. In the Solow model the author uses, ñinternational trade relaxes the borrowing constraints and enables a more open economy to invest at a higher rate and hence converge more quickly to its steady stateö (Lane, 2001). In this way, international trade promotes convergence in an indirect manner by allowing greater access to international capital markets since ñmore open economies are better credit risksö (Lane, 2001).

An alternative way is to use an endogenous growth model. Without looking for trade effects, endogenous growth literature is mostly based on the lack of income convergence globally. There are limited number of studies using these models in the literature that focuses on the impact of trade on convergence. Walz uses a three-country endogenous growth model and focuses on the enlargement of free trade zone or a common market as an indicator of integration. The author argues that if a technologically lagging country integrates into a free trade zone or customs union, overall growth of the zone increases due to reallocation of the resources. The connection of trade to convergence is associated with the changes of prices of factors of production including labour factor (Walz, 1998).

Ben-David (1993 and 1997) considers the effects of many trade-related phenomenons like trade openness, trade liberalization and trade volume on income levels and the findings strongly support the idea that trade causes convergence. Ben-David (1993) which studies the European Economic Community (EEC), focuses on major post-war trade liberalization periods. The author states the reason to choose this special group of countries such that the experiment of EEC gives a very useful area to search the link between trade and income convergence because during its evolutionary period, EECôs trade increased significantly but at the same time, the improvements in factor flows was negligible. For this reason, EEC seems to be a very suitable group to detect the separate effect of trade on income. Moreover the main purpose of the group is to eliminate trade restrictions among its members, so it is very coherent with what is intended to be done. His findings show that timing of trade reforms affect the convergence process among countries; different periods of convergence are linked to different trade liberalization movements.

Ben-David (1996), which focuses on the linkage between trade openness and convergence, creates trade-based groups and compare these groups with randomly-selected ones as well as the ones which are selected due to other criteria. The author concludes that trade-based groups are more likely to display convergence. However the author also stresses that the results alone are insufficient to distinguish between the two hypotheses: trade causes convergence and convergence causes trade. On the other hand, he underlines that ñé significant convergence, together with significant increases in the volume of trade, began to occur simultaneously with the removal of trade barriersò and in the findings similarity acts just as a catalyst (Ben-David, 1996).

On the other hand, Slaughter drastically claims that there is no evidence to argue that trade causes convergence. Slaughter (2001) perceives trade agreements as an indicator of liberalization and concentrates on four post-1945 multilateral trade liberalizations which are; establishment of European Economic Community (EEC), formation of European Free Trade Area (EFTA), liberalization between EEC and EFTA and the Kennedy Round of General Agreement on Tariffs and Trade (GATT). Assuming that convergence already exists before and after the establishment of these economic integrations, he searches the differences in rate of convergence to see if there is a positive effect of trade liberalization on convergence. The author uses a difference-in-differences analysis which compares the convergence pattern among the liberalizing countries before and after liberalization. The author uses the rate of convergence in the analysis, which means testing if there are any differences among convergence rates. The author criticized that the early studies finds evidence of convergence initially, and then link this finding to trade in one way or another (Slaughter 1997 and 2001).

According to Slaughter, difference-in-differences approach is designed ñé to study the impact of some ótreatmentô one compares the performance of treatment group pre- and post-treatment relative to the performance of some control group pre- and post-treatmentò (Slaughter, 2001). Control group must basically show what happens to the treatment group without any treatments, so it is not affected by the treatment but other factors. This approach seems to have the ability to show the pure trade effect on convergence. But the deficit of this analysis can be that decomposing trade liberalization from other economic and politic factors is extremely difficult, and additionally timing of trade liberalizations are different for all countries, therefore, they are not one-time events but rather they are implemented gradually. This can weaken the power of the test.

The author concludes that there is no strong, systematic linkage between trade liberalization and convergence and stresses to note that although there exists a positive relationship between trade and convergence, it does not mean that there is causality. It is possible that there might be some other factor, which is causing both.

Cyrus tries to find the direction of causality between international trade and cross-country income differences. The author examines 56 countries in the period 1965-2000 using bilateral trade data. The initial assumptions of the paper are; the average share of trade in income has increased and convergence has occurred. The paper argues that causality is bi-directional: trade cause convergence and convergence cause trade. Income differences are obstacles to trade but whether trade rises or decreases income differences is mixed: time-series results support the convergence theory, however cross-section analysis does not. The author argues: ñAt any given point in time, increased trade is associated with higher income differences, but over time, trade causes income differences to contractò (Cyrus, 2004). Cyrus also examines OECD countries separately and argues that the results for OECD countries differ in small ways but the underlying connections do not differ from non-OECD ones so she concludes that a óconvergence clubô does not exist for OECD countries.

In the convergence literature, the scope of the studies is an important factor, which affects the findings. Although there are studies that examine general bias in the whole world, most of the studies group the countries by some means and base the analysis on these groupings. This grouping can be based on being a member of an economical and/or political union, or some trade openness measure, or a performance index explaining the trade behaviour of countries.

Baumol, which examines the link between productivity growth and convergence using the long term data, benefits several related variables. One of these variables is ñconvergence of output per labour hour among industrialized nationsò. Instead of using specific unions or groups the author classifies countries as industrialized, intermediate and centrally planned economies and founds that post-war data suggests convergence phenomenon is acceptable for intermediate and centrally planned economies as well as the industrialized ones. On the other hand, Baumol links trade and convergence indirectly, using countriesô initial productivities and their average rates of productivity growth. According to the author, what makes convergence process work is spillovers from leaders to followers, and trade accelerates this process (Baumol, 1986).

Sachs and Warner generate convergence clubs according to policy choices. The authors establish two basic subsets of policies, one deals with the property rights and one deals with international trade. They determine conditions for both and define a country as óqualifyingô if the country passes both of the tests, and ónon-qualifyingô otherwise. During the period of 1970-1989, they search a tendency towards economic convergence among the subset of qualifying countries. Finally, the authors find strong evidence of convergence in qualifying countries, while non-qualifying countries show no tendency to converge.

In addition, it is argued that qualifying countries grow faster than non-qualifying countries, which tells us that good policies matter. On the other hand, the authors mention that there are also countries, which grow faster without satisfying these criteria, whereas the countries, which satisfy all the criteria, show a good growth performance. The authors conclude that, the conditions that they studied are not necessary but sufficient (Sachs and Warner, 1995).

Stroomer and Giles create groups due to their trade openness and test for convergence in output between them, using different time-series techniques. The authors state that, the measure of openness they adopt includes total trade with all trading partners, rather than focusing on just trade with each countryôs major trading partners. The authors also give an alternative way to define convergence, which is called ñcluster convergenceò. The authors utilize fuzzy clustering algorithm[1] method and state that the most important feature of the methodology is that the data themselves determine the cluster boundaries in a very flexible manner. So there is no prior presumption on the part of the researcher as to what constitutes a ólowô or óhighô level of openness (Stroomer and Giles, 2003).

An alternative is to create country groups based on income levels and investigate the tendency to converge among countries with relatively similar incomes.

Ben-David (1996) which was referred to before, uses income level based grouping method, excluding primarily oil producers or formerly Communist countries and poorest ones. The author also assumes that if trade plays an important role in convergence process, the evidence can mostly come from countries that are major trade partners and establishes major trade sub-groups between the chosen countries. The author also forms different groupings; randomly selected or due to other criteria

[1] Fuzzy-clustering method, which is introduced by Zadeh (1965), is new and interesting in convergence theory. Unlike the conventional set theory, the degree of membership to a group need not be 0 or 1, it can take any value between zero and unity, which can enable different degrees of membership with each of these fuzzy sets. Hence, economies are divided in clusters in terms of chosen qualification, using flexible boundaries rather than sharp ones between them (Stroomer and Giles, 2003).

to check whether his findings are still valid. He concludes that trade-based groups are more likely to show tendency to converge.

Ben-David (1997)ôs results are similar. Among 113 market economies, divergence is found globally. However, when the author classifies countries in three groups - wealthier, middle income and poorer economies- the results change significantly. Convergence clubs tend to be more applicable at the two ends of the bunch. Although, the results support the convergence theory, it is only obvious among the wealthiest countries. In poorer countries downward convergence occurs. Beside these varying results of the paper, one common element in converging countries is the contribution of international trade. Moreover, it is found that grouping the wealthier countries on the basis of trade instead of a random basis strengthens the results of convergence.

On the other hand, Nakajima, which searches ñhow the world income distribution evolves over time when countries interact with each other through international tradeò, uses a three-country model (high income, middle income and low income country). The difference of the study is that, the author searches for the convergence among these different level income countries. The main finding of the study is; even though divergence occurs initially, eventually the income gap between countries decreases, hence, catch-up process is supported by long-term data. The author states that, this conclusion, which seems self-contradictory is because of the opposite powers in the dynamics of the model. Leader countries are constrained by the speed of invention, which lead to convergence, but on the other hand international specialization and learning by doing which can be seen as advantages of leader countries cause divergence. Therefore, the author argues that, ñcatch-up occurs ôin turnô in the sense that there is a first stage in which the middle income country grows fastest, closing the gap with the richest country but increasing the income difference with the poorest, followed by a second stage where the poorest country catches upò (Nakajima, 2003).

Another way of studying convergence is to focus on a country and examine the interactions between it and its trading partners. Lee, Lim and M. Azali analyse Japan and ASEAN-5 economies (Indonesia, Malaysia, the Philippines, Singapore and Thailand) during the period 1960-1997. They do not relate trade to convergence directly but the economies they selected are highly trade-related and Japan is the major foreign direct investor and major trading partner for ASEAN countries. The results support the income divergence between Japan and ASEAN-5 economies which can be due to the differences in economical structures and levels of development of these countries. As a matter of fact, the paper finds evidence of long-run income convergence between Japanese and Singapore only (Lee, Lim and M. Azali, 2005).

Giles (2001) on the other hand, search output convergence and common trends for New Zealand and her four major trading partners; Australia, Japan, United Kingdom and United States over the period 1950 to 1992. The author states that, since this is a very open group of economies with a high degree of trade dependence, more positive convergence results are expected. However, the results are conflicting depending on the method used. Fuzzy-clustering algorithm supports convergence evidence strongly, whereas bivariate and multivariate time-series do not.

The brief review of literature presented in this chapter shows that, the link between international trade and convergence is not based on a proven theoretical foundation. Stroomer and Gill stated that ñneither traditional trade theory nor the various well known models of economic growth offer very many formal results that explain the possible connection between international trade and convergence in incomes across countries over timeò (Stroomer and Giles, 2003). Hence, trade and convergence debate flourishes mostly in empirical studies.

Within this empirical literature, the results of the studies vary due to many different aspects such as the definition of convergence, the development level of the countries that are considered, econometrical method utilized etc. It is more likely to find evidence in favour of trade and convergence relation when a specific group[2] of countries are considered. In addition, group of developed economies (wealthier, industrialized economies) show more tendency to converge rather than poorer ones.

The convention is to use either cross-section or time series method when dealing with trade and convergence relations. Trade openness measures (such as trade share in income) or trade liberalization programs are recognized as trade indicators in these studies. Unlike other studies Cyrus (2004) uses the panel approach, which allows for two dimensions of the data to be taken into account, and employs bilateral trade data as the trade indicator.

[2] This specificity refers to a classification due to some sensible criteria such as similar incomes, being a member of a economic and/or politic union, high level of trade volume in income etc.

CHAPTER III

THE SCOPE OF THE ANALYSIS

The intention of this chapter is to represent the scope of the analysis in detail and to give explanation about the reasons of studying the selected dataset. First, a brief history of European Union and Turkey relations is presented. Afterwards, distinguishing characteristics of the data are demonstrated, and finally, comparative statistics about Turkey and EU-15 countries are given. Abbreviations of country names are given in Appendix A.

3.1 Brief History of Turkey-European Union Relations

European Union (EU) is the best (and extreme) example of the economic integrations that developed after World War II, and with 27 member states it has become comparable to USA in population, GDP and land size (Bilici, Erdil and Yetkiner, 2008). Alongside the political and social reasons, economic purposes drived European countries to merge.

European Union was founded by six countries: Germany, Belguim, France, Italy, Luxemburg and the Netherlands. The core of EU goes back to the European Coal and Steel Community which was established in 1951 by these six countries. Then, in 1957, Rome Treaty was signed to form European Economic Community (EEC). Initially a customs union was formed in 1968, but more was needed to form an economic union. With ǘthe Single Actô which came into force in 1987, EEC transformed into a Common Market in 1993.

The Community had several enlargement movements. First, in 1973 United Kingdom (UK), Ireland and Denmark joined the EEC. Then, in 1981 Greece became the 10th member of the Community. In 1986, Spain and Portugal became members. Sweden, Finland and Austria joined the EU in 1994 forming EU-15. The most comprehensive englargement of the Union was in 2004 with ten new members: Malta, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia. Finally in 2007, Rumenia and Bulgaria became members.

From the very beginning of EU story, Turkey has paid close attention. Six countries that constitute EEC, were the major trade partners of Turkey and also Turkey had intensive political relations with them. Soon after the signature of Rome Treaty, Turkey applied for associate membership. The application resulted in an Association Agreement (known as the Ankara Aggreement) in 1963. The purpose was to establish a ñCustoms Union (CU)ò so that Turkey could trade goods and agricultural products with EEC countries without any restrictions. In 1987, Turkey submitted application for full membership. Although, it was denied in 1989, ñan incomplete CU between EU-15 and Turkey was created on 1 January 1996, guaranteeing free circulation of industrial goods and processed agricultural productsò (Danzinger et al., 2005). The customs union was considered as a step towards full membership at an indefinite future date.

At the Helsinki Submit of 1999, Turkey was given the status of candidate country for EU membership. Turkey has made progress in the realm of the common standards, the protection of intellectual property rights, competition rules and financial regulation. After these improvements the European Council decided to open membership talks with Turkey in 2005. However, fullfiling the economic criteria is not the main problem for Turkish accession. EU also requires some political and human rights criteria for membership. In this context, unlike the other candidate countries, Turkey has not received a timetable for accession.

3.2 A Brief Look At Data

3.2.1 Turkey and EU-15

The main aim of the trajectory of Turkey towards EU accession is essentially to achieve continuous improvement in living conditions through accelerated economic progress and the harmonious expansion of trade, and to reduce the disparity between the Turkish economy and the member countries.

In fact, high degrees of economic integration between Turkey and EU have already been achieved. ñThe agreement with Turkey goes beyond a normal CU though. It also covers the harmonisation of many standards and regulations such as technical legislation, the abolishment of monopolies and protection of intellectual propertyò (Lejour and Mooij, 2004). Moreover, Turkey has even adopted Common External Tariff of EU which is enforced on third trade partners (Antonucci and Manzocchi, 2005). Hence, leaving the potential economic gains of full membership aside, Turkeyôs special relation with EU provides a generous workspace to study the effects of these close relations on Turkish economy.

Nonetheless, the analysis considers the data of EU-15 countries rather than all the EU members. Most of the EU-15 countries are major trade partners of Turkey. According to the 2008 statistics, 5 of 10 countries that Turkey trades most are among the EU-15 countries (Germany, Italy, France, United Kingdom and Spain). Taking as a group, the trade shares of EU-15 in Turkeyôs total trade are shown in Table 3.1.

Table 3.1 Share of EU-15 Countries In Turkeyôs Total Trade

Year	Trade Volume of Turkey (Million US Dollars)	Trade with EU-15 (Million US Dollars)	Share of EU-15 (%)
1980	10,482	3,905	37.26
1981	13,566	4,471	32.96
1982	14,541	4,746	32.64
1983	14,219	4,775	33.58
1984	17,796	6,529	36.68
1985	19,298	7,645	39.61
1986	18,561	8,374	45.12
1987	24,352	11,261	46.24
1988	25,997	11,684	44.94
1989	27,387	12,215	44.60
1990	35,259	17,114	48.54
1991	34,640	17,244	49.78
1992	37,585	18,590	49.46
1993	44,778	21,476	47.96
1994	41,373	19,551	47.26
1995	57,304	27,939	48.76
1996	65,778	34,152	51.92
1997	74,830	37,117	49.60
1998	72,789	37,522	51.55
1999	67,274	35,767	53.17
2000	81,635	40,881	50.08
2001	71,717	34,180	47.66
2002	85,572	41,438	48.42
2003	113,918	55,538	48.75
2004	157,072	74,323	47.32
2005	186,219	81,296	43.66
2006	220,459	91,626	41.56
2007	271,030	107,823	39.78
2008	325,341	114,732	35.27

The second column demonstrates trade volume of Turkey with the world, and the third column illustrates trade values with EU-15 countries. The last column provides the share of EU-15 countries in Turkeyôs total trade on a percentage basis. From 1980 to 2000, the share of EU-15 countries shows an increasing pattern and takes its maximum value of 53.2% in 1999. Since 2000, the rates show a decreasing pattern and take the value of 41.6% in 2006.

In the last two years, due to the global financial crisis and the deficiency of demand in EU-15 countries, the rates are even worse. However, in the period 1980-2008, average share of EU-15 countries in Turkeyôs total trade is about 45%, which means almost half of Turkeyôs trade flows are with these countries.

The average shares of EU-15 countries in Turkeyôs total trade are illustrated in Figure 3.1. On average, Germany is the country that Turkey trades most. Italy, France, The United Kingdom, The Netherlands, Belgium and Luxembourg (as a single unit) and Spain and follow Germany in turn.

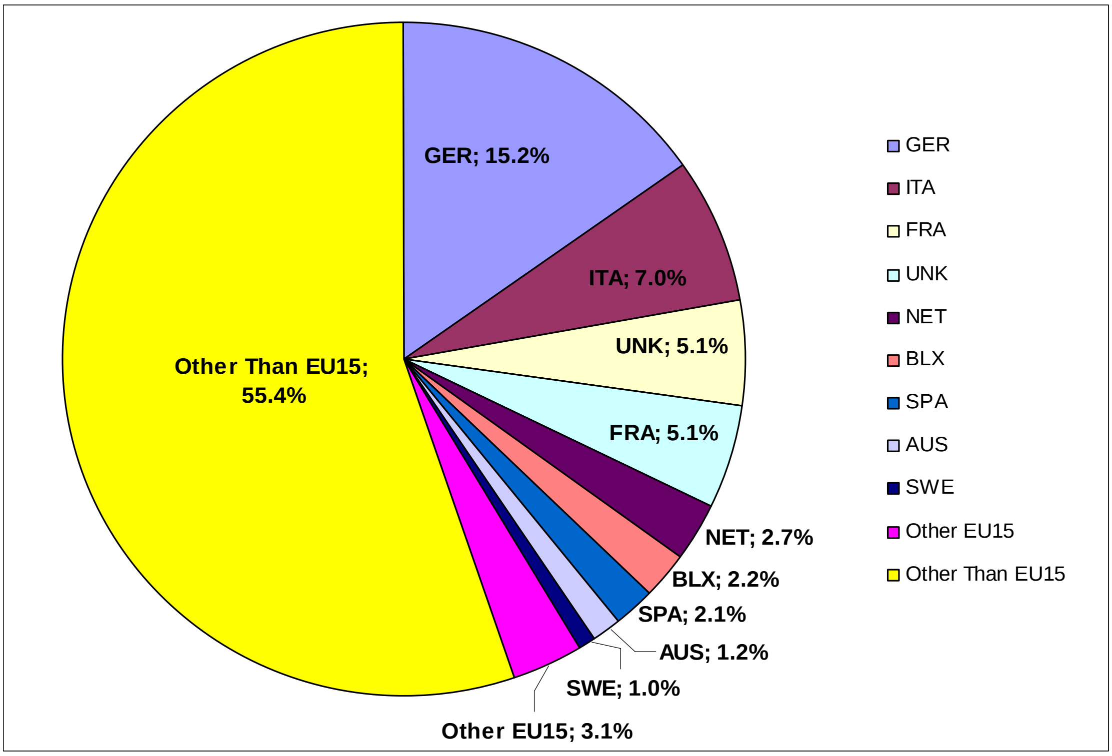

Figure 3.1 Average Shares of EU-15 Countries In Turkeyôs Total Trade (1980-2008)

By taking EU-15 countries into consideration in this study, the other European Union countries -Malta, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia, which became members with the eastern enlargement in 2004 and Romania and Bulgaria, which became members with the enlargement in 2007- are excluded. This is because; EU-15 countries exhibit a more homogeneous structure in terms of per capita GDP, per capita growth rates and other variables taken on in this study and more importantly they reflect the high living standards that Turkey tries to reach as being a member of EU.

3.2.2 Selected Period: 1980-2008

The study period is chosen as 1980-2008 which is the era of globalization. In this period all the economies had experienced conversion in their economic structures and liberal economic policies. In terms of international trade, the economies began to move away from the protectionist trade policies and have adopted more liberal policies. In parallel with global conjuncture, Turkey has moved from import substitution to export promotion as the growth strategy in 1980, and since then it has become a laboratory of testing the impact of free trade (Bilici, Erdil and Yetkiner, 2008).

Consequently, from 1980 to 2008, the average trade share in income has risen fairly consistently for EU-15 economies and Turkey. Table 3.2 shows trade shares in GDP for EU-15 and Turkey in the period 1980-2008. In 1980, average share of trade in income for EU-15 countries is 72.7% whereas the same ratio is 109.7 in 2008. On the other hand, Turkeyǿs trade share in income was 17% in 2008 and the ratio reaches 52% in 2008.

Table 3.2 Share of Trade in Income (1980-2008)

Year	EU-15 (Average)	Turkey (TR)
1980	72.73	17
1981	74.60	21
1982	74.27	27
1983	75.07	29
1984	79.80	35
1985	80.40	35
1986	72.33	29
1987	72.13	33
1988	73.87	36
1989	76.93	34
1990	75.27	31
1991	74.07	30

Table 3.2 Contôd

Year	EU-15 (Average)	Turkey (TR)
1992	73.20	32
1993	73.47	33
1994	77.00	42
1995	80.40	44
1996	81.87	49
1997	87.07	55
1998	89.80	42
1999	91.47	39
2000	102.07	43
2001	101.27	51
2002	96.80	49
2003	93.27	47
2004	97.67	50
2005	101.47	47
2006	107.13	50
2007	108.40	50
2008	109.73	52

Table 3.2 shows that, when compared to EU-15, Turkey has a smaller share of trade in income in every year in the period 1980-2008. Average share of trade in GDP for Turkey is 39% in the period 1980-2008. On the other hand, the same is 85.3% for EU-15 countries.

3.3 Comparison Based on Selected Economic and Social Indicators Between Turkey and EU-15

3.3.1 GDP

Figure 3.2 demonstrates the ranking of the countries in terms of GDP by constant 2000 US Dollars in 2008. Among the countries we consider, Germany is the largest economy with a GDP of about 2,1 trillion dollars. UK and France follows Germany with a GDP of 1,75 trillion dollars and 1,2 trillion dollars respectively.

Turkey is the seventh economy with its GDP of 387 billion dollars in 2008. Sweden, Belgium, Austria, Denmark, Greece and Finland follow Turkey respectively. The last three economies are: Ireland, Portugal and Luxembourg with GDPsô 138, 121 and 27 billion dollars respectively.

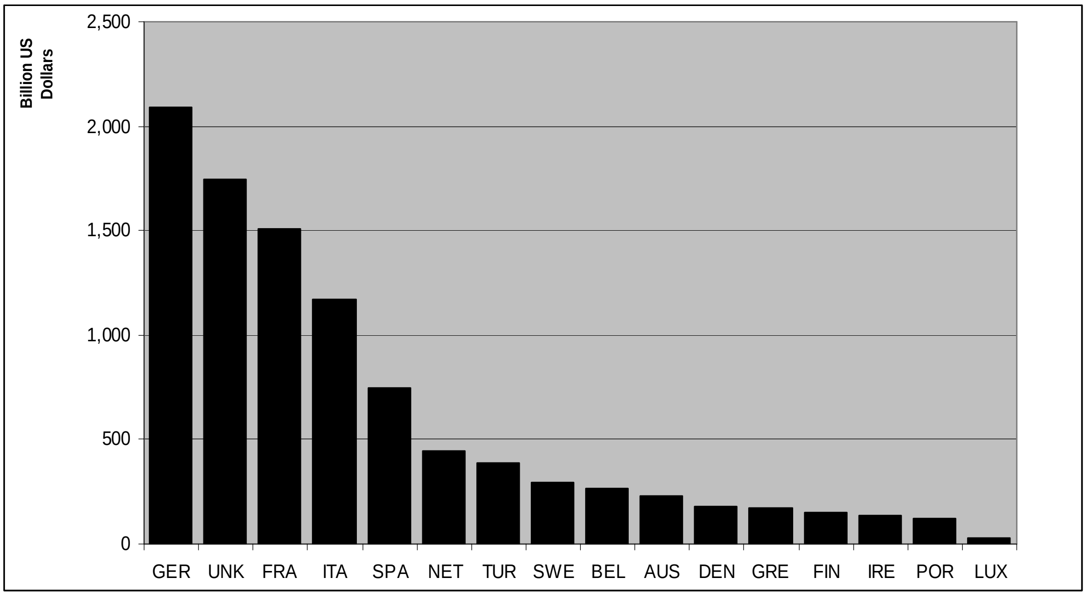

Figure 3.2 GDPs in 2008 (Constant 2000 US Dollars)

3.3.2 Population

Figure 3.3 shows the total population in 2008. Germany has the largest population with 82 million people and Turkey follows Germany with its population of almost 75 million people in 2008. Luxembourg is the last country in descending order with its population of 489 thousand people in 2008.

Figure 3.4 shows the average annual population growth rates of the countries in the period 1980-2008. Average population growth rate of EU-15 countries in aforementioned period is 0.4%. On the other hand, Turkeyös average population growth rate is 1.7%. There is a huge difference between Turkey and Ireland, which has the highest average population growth rate of about 1% among EU-15, as well.

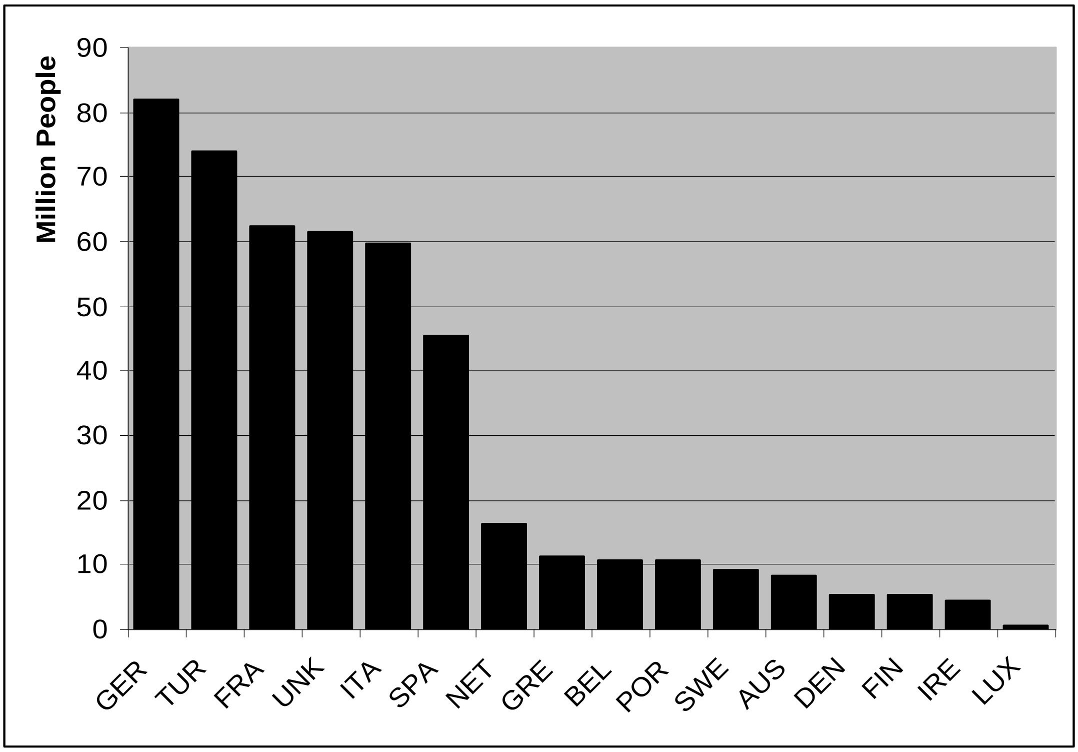

Figure 3.3 Populations in 2008

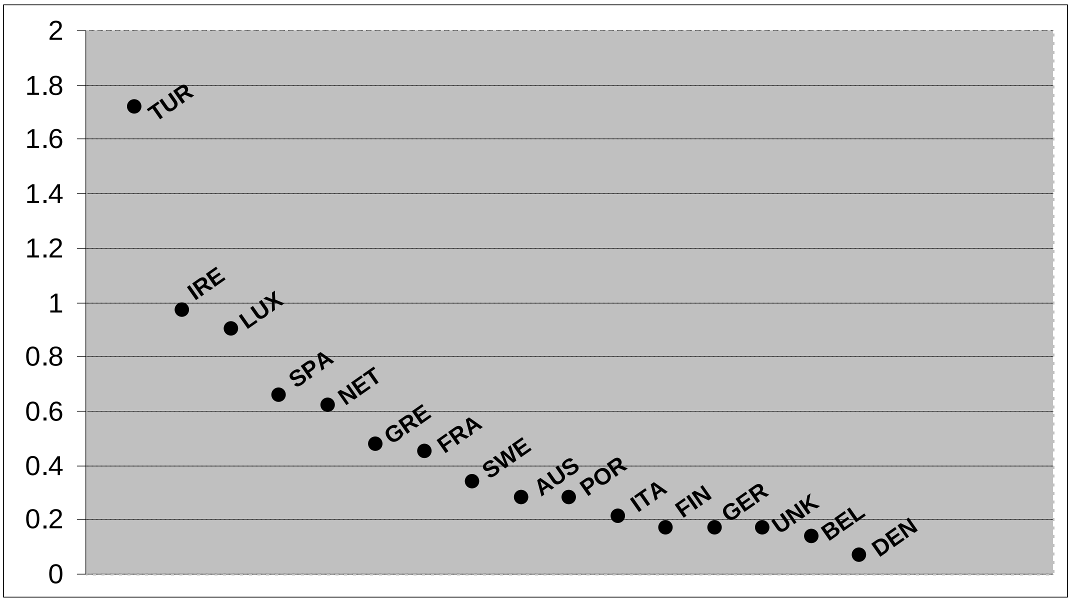

Figure 3.4 Average Population Growth Rate (Annual %, 1980-2008)

3.3.3 GDP Per Capita

Figure 3.5 demonstrates per capita GDPs of Turkey and EU-15 in 2008 by constant 2000 US Dollars in descending order. Turkey ranks the last with 5,240 US Dollars.

Luxembourg is the country with the highest per capita income of 54,798 US Dollars. Denmark, Sweden and Ireland follow Luxembourg with per capita GDPs of; 32,426, 32,243 and 30,929 US Dollars respectively. The average of per capita GDPs of the EU-15 countries in 2008 is 26,625 US Dollars which is more than 5 times of Turkeyôs.

The figures show that there is an important income difference among Turkey and EU-15 countries. Portugal has the smallest GDP per capita among EU-15 that is 11,413 US Dollars, which is still two-fold of Turkeyôs.

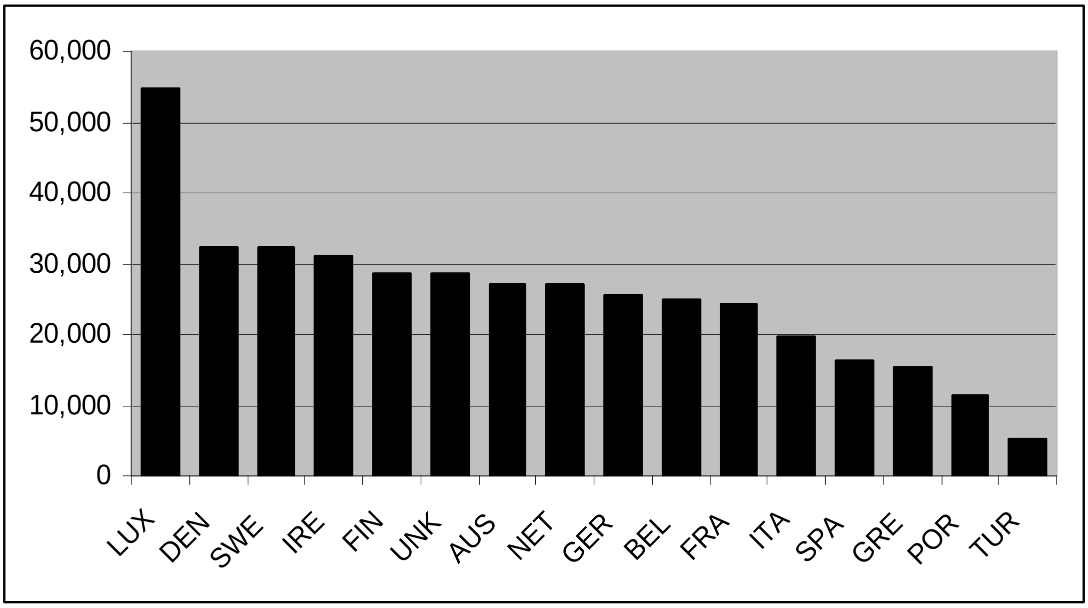

Figure 3.5 GDP Per Capita in 2008 (Constant 2000 US Dollars)

3.3.4 Education Expenditure

Figure 3.6 illustrates the education expenditure as a percentage of Gross National Income (GNI). Sweden has the highest average education expenditure ratio of about 7.4%. Denmark, Finland and Ireland follow Sweden with ratios 7.2, 6 and 5.4 respectively. The smallest average education expenditure ratio is 2.4%, which belongs to Greece. On the other hand, Turkeyôs average ratio is 2.5%, which is slightly over than Greeceôs ratio.

Considering EU-15 countries jointly, the average education expenditure ratio is 5% in 1980-2008, which is almost two fold of Turkeyôs average ratio.

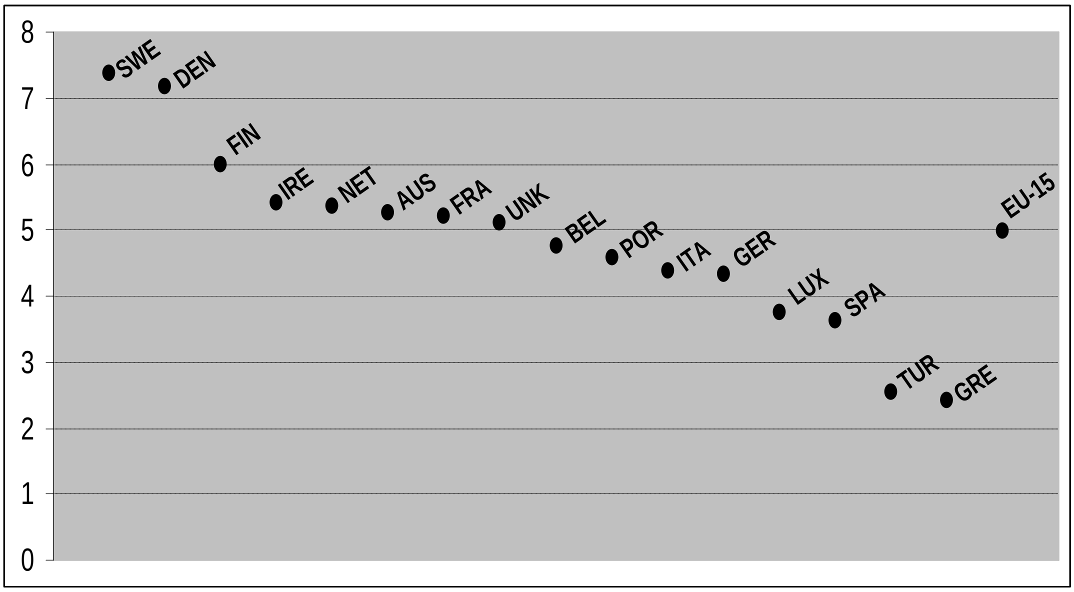

Figure 3.6 Average Education Expenditure (% of GNI, 1980-2008)

3.3.5 Investment Share

Figure 3.7 illustrates the average investment shares as a percentage of GDP in 1980-2008. It shows that, average investment ratios do not display big differences among countries in interest. Portugal has the largest ratio of 27.6, whereas UK has the smallest ratio of 17.7. The EU-15 average is 21.7, which is almost same as Turkeyés average of 21.6.

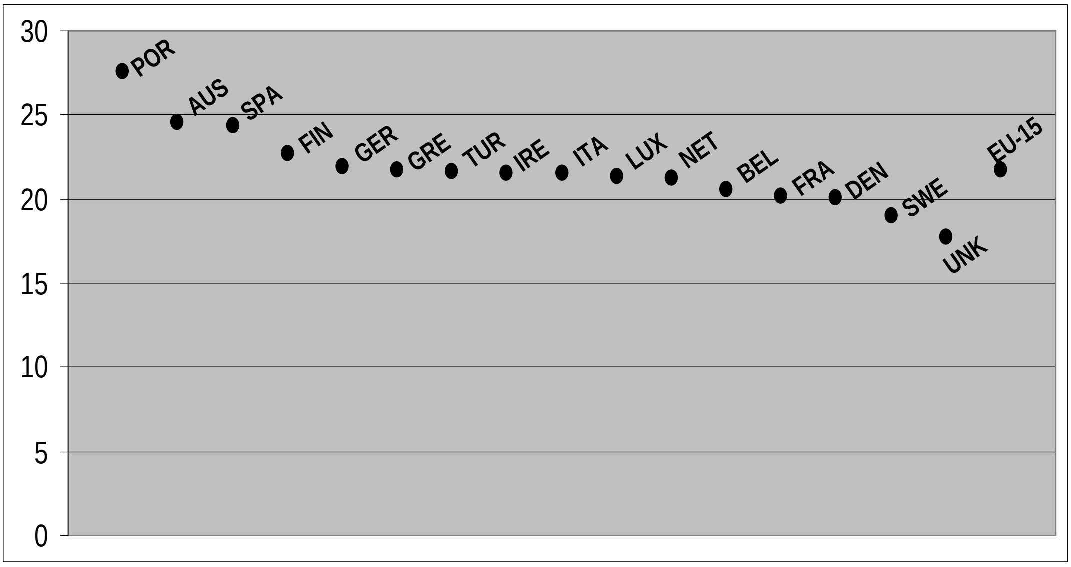

Figure 3.7 Average Investment Share (% of GDP, 1980-2008)

A brief examination of this chapter shows that, Turkey has an intensive trade relation with EU-15. In 2008, 5 of 10 countries that Turkey trades most are among EU-15, and moreover, in the period 1980-2008, almost half of Turkeyés trade is with EU-15. In economic aspect, Turkey falls far behind of these countries in terms of per capita GDP and education expenditure; however, she is compatible in terms of size (GDP and population) and investment share.

CHAPTER IV

THE MODEL

In this study, in order to examine relation between international trade and per capita income differences, two equations are estimated; a dispersion equation for the impact of bilateral trade on per capita income differences and a gravity model of trade for the impact of per capita income differences on bilateral trade.

In this framework, first the theoretical considerations of the two equations are stated. Then, empirical models that are estimated are represented. Finally, explanations and sources of the data are given.

4.1 Theoretical Considerations

In this part, theoretical backgrounds of convergence theory and gravity model, which form the basis of two equations that are estimated in this thesis, are given. Since the studies that examine the affect of trade on convergence use either time-series or cross-section methods, panel data approach hardly exists in this literature. Therefore, section 4.1.1 provides the alternative models rather than panel data approach. In section 4.1.2 the brief history and theory of gravity model are stated.

4.1.1 Convergence Theory

There are several definitions of income convergence in literature; convergenge within an economy vs. convergence across economies, absolute (unconditional) convergence vs. conditional convergence, global convergence vs. club convergence, deterministic convergence vs. stochastic convergence etc (Islam, 2003). The definition adopted affects the method that is utilized, and the results of the studies partly depend on the definition, as well.

A useful distinction between two types of convergence, which is referred to frequently in the literature, can be stated as follows: -convergence which refers the situation that, the dispersion of per capita income among a group of countries falls over time and - convergence, which refers to the situation that the correlation between growth in income over time and initial income level is negative (Young, Higgins and Levy, 2007).

-convergence seems necessary but not a sufficient condition for -convergence. Quah (1993) and Friedman (1992) both suggest that analyzing the behavior of per capital income differences -which corresponds to the definition of -convergence- is more reasonable to analyze the existence of convergence since it directly considers whether the distribution of income across economies tends to equalize.

Ben David (1993) which studies four trade liberalization movements after the World War II and their effects on income equalization states: ñFor convergence to occur, there must exist a negative relationship between a countryôs initial level of per capita product and its per capita growth ratesò. The author suggests that poor countries need to grow faster to make convergence theory works.

Ben David (1996) uses a group of countries, which are major trading partners to study convergence hypothesis and he defines convergence as a ñé .reduction in income differentials within specific group of countries forming over time. Ben David (1997) examines the behaviour of income gaps among the countries at different levels of development. Like his former study, he defines convergence as a reduction in income disparity among the countries within a group over time, using the relationship between countriesô initial per capita incomes and their average rates of per capita income growths.

Gomez and Santaularia (2007) which study the relation between trade liberalization and regional income convergence in Mexico, make use of the concept of ñlong run convergenceò implying the end of the process of narrowing per capita income disparity between two economies. By this definition convergence theory suggests that income differences are steady over time. Li and Papell (1999) define convergence as a tendency of per capita income of countries to equalize over time.

Although there are several definitions of income convergence, empirical analysis mostly arises in either of two ways: cross-section or time series analysis. First one tests convergence hypothesis by examining cross-section correlation between initial per capita income levels and per capita income growth rates within a group of countries. The second one tests convergence hypothesis by searching the long run behaviour of per capita income differences across countries (Bernard and Durlauf, 1994).

Bernard and Durlauf (1994) generalize the cross-section models used in the literature as follows:

$$g_{i,T} = \alpha + \beta y_{i,0} + \mu_{i,T} \qquad (4.1)$$

where $g_{i,T}$ is the average growth rate, hence $g_{i,T} = T^{-1}(y_{i,T} - y_{i,0})$ for each of N economies and T is a fixed horizon.

In order to have convergence, β needs to be negative, implying a negative relation between initial per capita incomes and average growth rates. Negative β means that, per capita income differences have decreased between some pairs of countries in the sample, however, it could not discern which country pairs they are.

Time-series models could be constructed in two ways: It is possible to search the behaviour of a countryôs per capita income comparatively to an average of a group of countries (hence estimating time-series models for each country) or it is possible to make it comparative to a single country (hence estimating time-series models for each country pair).

For the first type, the model used by Ben-David (1993) and Ben-David (1996) is as follows:

$$(y_{i,t} \text{ ï } y_t) = \phi\, (y_{i,t-1} \text{ ï } y_{t-1}) + \mu_{i,t} \qquad (4.2)$$

where $y_{i,t}$ is country iôs log of per capita income in year t, y_t is the unweighted average of the log per capita incomes of the group of countries in year t.

In order to have convergence within the group, ϕ must be smaller than 1, on the other hand, ϕ ü 1 indicates divergence among the group of countries.

Assuming $z_{i,t} = y_{i,t} \text{ ï } y_t$, the equation becomes:

$$\text{æ}\, z_{it+1} = -\text{´}\ z_{it} \qquad (4.3)$$

where $\text{æ}\, z_{it+1} = z_{i,t+1} - z_{i,t}$.

The convergence coefficient, which is ´ = 1- ϕ, indicates the rate of convergence of country iôs per capita income to the groupôs average income level. Thus, larger the convergence coefficient ´, the faster is the convergence.

Using time-series models, Li and Papell (1999) defines two kinds of convergence: Stochastic convergence, the weaker situation, happens if the log of relative output is trend stationary whereas deterministic convergence, the stronger situation, arises if the log of relative output is level stationary.

Second form of time-series models is as follows:

$$(y_{i,t} - y_{j,t}) = \phi\ (y_{i,t-1} - y_{j,t-1}) + \mu_t \qquad (4.4)$$

where $(y_{i,t} - y_{j,t})$ is the logarithmic difference in per capita income between countries i and j at time t.

Once again, convergence occurs when ϕ is smaller than 1.

Following Gomez and Santaularia (2007), equation 4.4 can be expanded:

$$\Delta(y_{i,t} - y_{j,t}) = \mu + \beta T + \alpha\ (y_{i,t-1} - y_{j,t-1}) + \sum \delta_k\ \Delta(y_{i,t-k} - y_{j,\ t-k}) + \mu_t \qquad (4.5)$$

where $(y_{i,t} - y_{j,t})$ is logarithmic difference in per capita income between countries i and j at time t and T is deterministic trend.

If $\beta < 0$ and $\alpha < 0$, the series $(y_{i,t} - y_{j,t})$ is stationary around a negative deterministic trend i.e. there is a tendency for the difference in per capita income to narrow over time which refers to catching up hypothesis. If $\beta = 0$ and $\alpha < 0$, the series y_i and y_j are cointegrated, i.e. the reductions in per capita income difference have ended and remain stable over time. Finally, if $\beta = 0$ and $\alpha = 0$, income disparity follows a random walk means that per capita income difference is unpredictable. The authors contribute to the literature by the definition of "loose catching up", which appears when $\beta < 0$ and $\alpha = 0$, meaning that income difference is decreasing but in an "erratic" way.

The majority of the studies considering trade and convergence relation create groups of countries – such as major trade partners-, and test convergence hypothesis on these groups without using any trade variable in equations. This situation mainly depends on the general tendency of using either one of cross-section or time-series method. On the other hand, the panel data methods allow trade variable to be used in equations as a regressor.

In addition, time-series and cross-section analysis can not control for individual heterogeneity, whereas panel data can do. Panel data also give more information on data and less collinearity among the variables (Baltagi, 2001). Hence, it is preferred to use panel data in empirical analysis of this thesis.

4.1.2 Gravity Model

Gravity models are commonly used in economics, especially for modeling and predicting foreign trade flows. Gravity type models are also frequently used for policy analyses, including trading blocs, economic integrations such as European Union (EU), Common Market of the South (MERCOSUR), North American Free Trade Agreement (NAFTA) or international organizations resembling World Trade Organization (WTO), currency unions, political blocs, patent rights, migration flows etc (Cheng and Wall, 2005).

Gravity models have become prevalent in empirical analysis of international trade flows since 1960s. The very first applications belong to Tinbergen (1962), Poyhonnen (1963) and Linnemann (1966).

The name of the model comes from its analogy with Newtonôs law of universal gravity (Penh, 2008):

$$F_{ij} = G \frac{M_i M_j}{D_{ij}^2} \qquad (4.6)$$

In the formula, F_{ij} represents the force of gravity between the objects i and j. M_i and M_j are the masses of the objects i and j respectively. D_{ij} is the distance between the objects i and j, and G is the gravitational constant. By the formula; the force of gravity is a positive function of the objectsô masses and a negative function of the square of distance between them, meaning that attraction is larger between larger and more closely placed bodies.

Gravity model specification in international trade similar to Newtonôs Law:

$$X_{ij} = \frac{A\, Y_i^{\alpha} Y_j^{\beta}}{D_{ij}^{\theta}} \quad (4.7)$$

where X_{ij} is exports from country i to country j; or total trade (i.e. $X_{ij}+X_{ji}$), Y is economic size (GDP or population), and D_{ij} is distance between country i and j.

Hence, the model claims that the volume of foreign trade between two countries is directly proportional with their incomes, but inversely proportional with the geographical distance between them.

On the other hand, most of the empirical studies assume a log-linear functional form for gravity equations:

$$\text{In Trade}_{ij} = \alpha_0 + \alpha_1 \text{ In GDP}_i + \alpha_2 \text{ In GDP}_j + \alpha_3 \text{ In } D_{ij} + é + \mu_{ij} \quad (4.8)$$

where, $Trade_{ij}$ is the the volume of trade between country i to j, GDP_i and GDP_j are the GDPs of country i and j respectively, and D_{ij} is the distance between countries i and j.

The coefficients α_1 and α_2 are expected to be positive and α_3 is expected to be negative. Distance between the countries is assumed to reflect the transportation costs. However, many other dummy variables such as adjacency, common language, colonial links, common currency, infrastructures, institutions, migration flows are used in regressions.

Initially, gravity equation was developed for cross-sectional analyses. However starting with 1980s, panel data analyses of gravity equation appeared and became more widespread. It is argued that, cross-sectional analysis is very likely to suffer from omitted variable bias since it does not deal with heterogeneous trading relationships (Cheng and Wall, 2005).

Thus, the gravity equation for panel analyses becomes:

$$\text{In Trade}_{ijt} = \alpha_0 + \alpha_1 \text{ In GDP}_{it} + \alpha_2 \text{ In GDP}_{jt} + \alpha_3 \text{ In D}_{ij} + \acute{e} + \mu_{ijt} \qquad (4.9)$$

where $Trade_{ijt}$ is the volume of trade from country i to country j at time t, GDP_{it} is the GDP of country i at time t and GDP_{jt} is the GDP of country j at time t, D_{ij} is the distance between countries i and j and it is time-invariant.

Gravity model is an important tool for international trade modelling and even early empirical studies have used gravity model with an obvious success. It is seen that, the model fits the data well and has a high explanatory power. The data used in gravity models are easy to obtain and there are standard practices that facilitate the process of analyses. However, the empirical success of the gravity models is not an adequate explanation of why gravity models became so popular for trade modelling. Hence, recently theoretical backgrounds for gravity models are developed as well.

Anderson (1979) is the first study forming theoretical backgrounds for gravity model for trade. Bergstrand (1990) and Anderson and Van Wincoop (2003) are some other examples in this context.

It is remarkable that, gravity models can be derived from very different theories of international trade, even conflicting ones. Leamer and Stern (1970) use a probability model to derive gravity equation; Anderson (1979) applies both Cobb-Douglas and CES utility functions; Bergstrand (1985 and 1990) also use CES utility function and generalize gravity model including prices; Bergstrand (1989) employs monopolistic competition model and Bergstrand (1990) employs Linder's hypothesis; Helpman and Krugman (1985) utilizes the assumption of increasing returns to scale in production. Although, gravity model can be criticized in this aspect, it is still very popular in international trade studies due to its empirical success, appropriateness and high degree of flexibility.

4.2 Empirical Model

As mentioned previously, the relation between trade and convergence is analyzed for Turkey and EU-15 for the period 1980-2008 in this thesis. The relation has two directions. The affect from trade to convergence is studied with an income dispersion equation, and the affect from convergence to trade is studied with a trade equation which has a gravity functional form.

When studying per capita income convergence via international trade, a trade openness measure like share of exports in GDP or share of trade volume in GDP is commonly used in the literature. However in this study, following Cyrus (2004), instead of using a trade openness measure, it is preferred to use the bilateral trade data, which provides richer information and allows more observations to be taken into account.

As it is mentioned in Cyrus (2004), the channels which trade affect per capita incomes are technology transfers and knowledge spillovers, i.e., learning from trading partners. The pressures, which exist in a competitive world lead countries to be more efficient and hence, international trade drives countries towards faster growth. Backwardness exhibits some advantages which makes the convergence process work: by technology transfers and learning from trading partner, lagging countries have a potential for rapid growth whereas the leader countries need to be more creative (Abramovitz, 1986). Thus, including information about trade partners in bilateral forms enhances the analysis.

Moreover, the selected group in our study is very specific and the interactions are important. As the basic question of this study is whether economic and commercial relations of Turkey with EU-15 have some effects on per capita income convergence via growing trade, it is more reasonable to consider bilateral trade data rather than a trade openness measure.

4.2.1 Income Dispersion Equation

The income dispersion equation estimated in this study is based on the Solow growth model. Mankiw et al. (1992) augment the Solow growth model by including accumulation of human capital as well physical capital. The model they estimated is:

$$\text{In}\, y_i = \beta_0 + \beta_1\, \text{In}\,(n_i + g + \breve{u}) + \beta_2\, \text{In}\,(s_{ki}) + \beta_3\, \text{In}\,(s_{hi}) + \mu_t \qquad (4.10)$$

where "y" is income per effective unit of labor, "n" is the growth rate of the working-age population, "$g+\breve{u}$" is for advancement of knowledge and depreciation rate (which are assumed to be constant across countries), "s_k" is the fraction of income invested in physical capital and "s_h" is the fraction of income invested in human capital. Hence, their model explains income per capita with population growth and accumulation of physical and human capital (Cyrus, 2004).

In this thesis, taking the augmented Solow growth model as a basis, investment share as a percentage of GDP is used instead of physical capital accumulation rate, and education expenditure as a percentage of Gross National Income (GNI) is used for human capital accumulation rate. Hence, income dispersion equation has the following form:

$$\begin{aligned} \left|(\text{In}\, y_{Turkey,t} - \text{In}\, y_{jt})\right| = {} & \beta_0 + \beta_1\, (\text{In Trade}_{Turkey,j,t}) + \beta_2 \left|(\text{In}\, y80_{Turkey} - \text{In}\, y80_j)\right| \\ & + \beta_3 \left|(inv_{Turkey,t} - inv_{jt})\right| + \beta_4 \left|(edu_{Turkey,t} - edu_{jt})\right| \\ & + \mu_{ijt} \qquad (4.11) \end{aligned}$$

where óyô is per capita income, óy80ô is per capita income in year 1980, óinvô is the investment share as percentage of GDP and óeduô is education expenditure as a percentage of GNI.

In order to verify trade affect on convergence, β_1 is expected to be negative. Thus, when volume of trade between countries increases, per capita income difference decreases. On the other hand, if β_1 is positive, it means that increasing trade cause per capita income divergence.

β_2 is expected to be positive, indicating that, the bigger the initial difference in income per capita between countries, the bigger the difference in current income dispersion. If the initial difference in income is bigger, the lagging country needs to grow faster.

β_3 is also expected to be positive. Since a positive link between saving rate and growth is assumed, if the difference in investment shares of countries increases, the difference of income per capita between the countries needs to be bigger in favour of the country which has a higher investment share.

On the other hand, the sign of β_4 is ambiguous. Education expenditure as a percentage of GNI reflects the development level of human capital. β_4 is positive, if the increase in the difference between countriesô education expenditure as a percentage of GNI causes the increase in per capita income difference. It means that there exists a positive link between education expenditure and growth. On the other hand, if β_4 is positive, it is interpretable that, when the difference in education expenditure is high, it is easier and faster for the lagging country to catch up. Here the difference of education expenditure could be an indication of the technological gap, and it is always easier to transfer and reproduce technology rather than creating it.

4.2.2 Trade Equation

The second model is a trade equation in a log-linear gravity form:

$$\text{In Trade}_{Turkey,j,t} = \beta_0 + \beta_1 (\text{In GDP}_{Turkey,t} + \text{In GDP}_{jt})$$
$$+ \beta_2 \left| (\text{In } y_{Turkey,t} \text{ ï } \text{In } y_{jt}) \right| + \beta_3 (\text{In DIST}_{Turkey,j}) + \varepsilon_{ijt}$$

where ó$\text{Trade}_{Turkey,j,t}$ô is the bilateral trade (exports + imports) from Turkey to country j at time t, óGDPô is Gross Domestic Income, óyô is per capita income and ó$\text{DIST}_{Turkey, j}$ô is the distance between Turkey and the country jôcapitals .

In the regression, the variable ó(In GDP_{Turkey} + In GDP_j)ô is used to normalize for size, in other words to cut off the effects of differences or similarities in per capita income. It is reasonably assumed that, holding distance constant, Turkeyôs trade with a smaller country will be less than its trade volume with a larger country, since the country with the smaller GDP has less to trade.

It is expected that β_1 will be positive and β_3 will be negative since the gravity model argues that trade between countries increases with the size of the countries (GDP, population) and decreases with the distance between them. On the other hand, if β_2 is negative, it means that when the differences in per capita incomes increase bilateral trade decreases confirming Linderôs hypothesis. If international trade is based on differences not similarities as Heckcher and Ohlin argues, then β_2 must be positive, meaning that when differences in per capita incomes increases, bilateral trade increases as well.

4.3 Data Sources

Annual bilateral trade data from 1980 to 2008 are obtained from United Nations Commodity Trade Statistics Database as Standard International Trade Classification

(SITC) Review 1 format. Reporter country is Turkey, and EU-15 countries are taken as partners. Selected trade flows are import and export, and the trade volumes (import plus export) are calculated by the author.

The data on distance is the theoretical air distance (great circle distance). Data on distances are obtained from the web site: www.timeanddate.com/worldclock/distanceresult.html. Distances from Ankara (capital city of Turkey) and the capital city of the partner countries are considered.

The data on investment shares (% of GDP) are obtained from International Monetary Found (IMF) World Economic Outlook Database, April 2011. Data are based on individual countries' national accounts statistics. For many countries, the estimates of national saving are built up from national accounts data on gross domestic investment and from balance of payments-based data on net foreign investment.

Other data are obtained from the World Bankǿs World Development Indicators (WDI) database and briefly explained in as follows:

GDP (Constant 2000 US Dollars) is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant U.S. dollars.

GDP Per Capita (Constant US 2000 Dollars) is gross domestic product divided by midyear population.

Adjusted Savings Education Expenditure (% of GNI) refers to the current operating expenditures in education, including wages and salaries and excluding capital investments in buildings and equipment as a percentage of GNI.

The symbols of the variables used in estimation equations are shown in Table 4.1.

Table 4.1 Symbols of the Variables in Estimation Equations

Symbol	Variable
YD	The absolute value of the difference in log of Turkey's per capita income and log of country j's per capita income
T	The log of the trade volume (exports+imports) between Turkey and country j
Y80D	The absolute value of the difference in log of Turkey's per capita income in 1980 and log of country j's per capita income in 1980
INVD	The absolute value of the difference in investment share (%of GDP) of Turkey and investment share (%of GDP) of country j
EDUD	The absolute value of the difference in education expenditure (%of GNI) of Turkey and education expenditure (%of GNI) of country j
D	The great circle distance between Ankara and country j's capital
GDPT	The sum of log of Turkey's total GDP and log of country j's total GDP
POPT	The sum of log of Turkey's total population and log of country j's total population
TRPOP	Dummy variable representing EU-15 countries that Turkish population is over %1 of total population of that country
CU	Customs Union dummy variable that is 1 for year 1996 and after

CHAPTER V

EMPIRICAL ANALYSIS AND RESULTS

Two equations that are represented in previous chapter were estimated using a panel of annual observations, covering Turkey and EU-15 countries for 29-year period (1980-2008).

Since the trade data for Germany were reported separately (Democratic Republic of Germany and Federal Republic of Germany) before 1991, the trade data for Germany in 1980-1990 period were calculated by adding up the two.

Hence the trade data for Belgium and Luxembourg are reported jointly before 1999 in consideration of Belgium Luxembourg Economic Union (BLEU), two countries are taken as a single unit in the analysis and the number cross section data has become 14. All other data of Belgium and Luxembourg were arranged in this context; for percentage values the arithmetic average, and for numeric values the sum of the two countries were used. On the other hand, the trade data for Luxembourg has missing values for three years (1999, 2000 and 2001). Rather than computing these values, it has been preferred to leave them incomplete and use unbalanced panel in the analysis.

All computations reported were done using EVIEWS Version 6. Since our data set contains higher number of time series data (T=29) than the number of cross sectional data (N=14), it has preferred to utilize ópooled time-series, cross -section dataô technique. All estimation results and graphs of the data used in estimations are demonstrated in Appendix B in detail.

5.1 Income Dispersion Equation

As mentioned in the previous chapter, the baseline income dispersion equation takes the following form:

$$YD_{jt} = \beta_0 + \beta_1 T_{jt} + \beta_2 Y80D_j + \beta_3 INVD_{jt} + \beta_4 EDUD_{jt} + \mu_{jt} \qquad (5.1)$$

where óYD_{jt}ô is the absolute value of the difference in log of Turkeyôs per capita income and log of country jôs per capita income at time t, óT_{jt}ô is the trade volume (exports+imports) between Turkey and country j at time t, ó$Y80D_j$ô is the absolute value of the difference in log of Turkeyôs per capita income in 1980 and log of country jôs per capita income in 1980, ó$INVD_{jt}$ô is the absolute value of the difference in investment share (%of GDP) of Turkey and investment share (%of GDP) of country j at time t, and œ$EDUD_{jt}$ô is the absolute value of the difference in education expenditure (%of GNI) of Turkey and education expenditure (%of GNI) of country j at time t.

Before estimating the equation, the stationarity of the variables have been checked. Panel unit root tests that are assuming common Auto Regressive (AR) structure (ñCommon root-Levin, Lin, Chuò, ñCommon root-Breitung) and individual AR structure which allows different AR coefficients in each series (ñIndividual root-Im, Pesaran, Shinò, ñIndividual root-Fisher-ADFò, ñIndividual root-Fisher-PP) were applied to each variable where applicable (see Apprendix B, Table B.1.1, Table B.1.2, Table B.1.3 and Table B.1.4). The variables, YD, T and EDUD were found as I(1), on the other hand, INVD variable was found as stationary.

Pedroni (Engle-Granger based) panel cointegration test was performed for the I(1) variables. Both for within and between dimensions, the null hypothesis of óno cointegrationô has been accepted (see Appendix B, Table B.1.5).

As demonstrated in Chapter 3, the trade volume between Turkey and EU-15 countries has an increasing pattern in the selected period. However, as the convergence theory implies per capita income differences are expected to contract over time. Hence, T is expected to become larger, whereas YD is expected to become smaller year after year, it seems reasonable that variables YD and T might not follow similar patterns through time. Furthermore, as suggested in Philips and Moon (1999), pooled regressions of level equations with I(1) errors will yield consistent estimates of ñinteresting long-run relationsò between explanatory variables and dependent variable if N and T are large enough and the panel is cross-sectionally independent.

5.1.1 Results of Estimations

Equation 5.1 has estimated with Pooled Least Squares (PLS), with cross-section fixed effects (FE) and with cross-section random effects (RE), which are named Model I, Model II and Model III respectively. Table 5.1 contains estimation results of these models (see Appendix B, Table B.1.6, Table B.1.7 and Table B.1.8).

In all three estimations, the coefficient of T is significant at 99% level, and the sign of the coefficient is negative which confirms the positive relation between trade and convergence. The values of coefficients of T in each equation are very similar as well: 1 percent increase in bilateral trade volume lowers the difference of two countriesô per capita GDP by 0.019 per cent.

Fixed-effects and random effects methodologies have the advantage of taking into account country-pair heterogeneity (Cyrus, 2003). Fixed effects model allows for endogeneity of all regressors with individual effects, whereas random effects model assumes exogeneity of all regressors with the random individual effects (Baltagi, 2001).

Table 5.1 Estimation Results of Model I, Model II and Model III

Variable	Model I PLS	Model II FE	Model III RE
CONSTANT	0.293443** (0.100618) (2.9164)	2.075404** (0.114484) (18.12834)	0.300558 (0.174922) (1.71824)
T	-0.018576** (0.005264) (-3.528921)	-0.018832** (0.005041) (-3.735759)	-0.018914** (0.00499) (-3.790481)
Y80D	1.003113** (0.028746) (34.89567)	-	1.031298** (0.08804) (11.71404)
INVD	0.006188* (0.002556) (2.421039)	0.003301 (0.001925) (1.714553)	0.003413 (0.001923) (1.774996)
EDUD	-0.00803 (0.006662) (-1.205371)	-0.024098** (0.006388) (-3.772393)	-0.023302** (0.00632) (-3.686927)
R^2	0.853996	0.924775	0.265143
SSR	6.541729	3.370463	3.464213

- The first parentheses under the estimated coefficients represent standard errors, and the second parentheses represent t-ratios.
- ** significant at 1%; * significant at 5%.

Since our panel data does not consist of randomly selected countries, fixed effects model is more appropriate. Redundant Fixed Effects Test, which is applied on Model II, has also confirmed that fixed effects are significant (see Appendix B, Table B.1.10). Random effects model is shown for comparison. Model III was estimated using Swamy and Arora (SA) approach. Another approach for random effects model is Wallace and Hussain (WH), which is represented in Appendix (see Appendix B, Table B.1.9), has given very similar results to SA.

Although it is preferred to continue with fixed effects for the purposes of economic compatibility, it is important to note that time-invariant variables such as ōY80Dô can not be included in the estimation with this specification. However, estimation of Model I and Model III shows that, Y80D is significant in explaining the YD: 1 per cent increase in initial per capita income difference leads to 1 per cent increase in current income difference.

Assuming homoskedastic disturbances with the same variance across time and individuals may be a restrictive assumption for panel data since cross sectional units may display different variation (Baltagi, 2001). Taking this into consideration, equation 5.1 was estimated with fixed effects and taking into account of cross-section heteroskedasticity (Model IV). Cross-section heteroskedasticity allows for a different residual variance for each cross section, whereas residuals between different cross sections and different periods are assumed to be 0.

Durbin Watson (DW) statistics for Model I, II and III, which are 0.136, 0.247 and 0.124 induce for positive autocorrelation. Hence, equation 5.1 was also estimated by taking into account autocorrelation (Model V) where AR(1) term has been added to the specification as a common coefficient. Table 5.2 demonstrates the estimation results of Model IV and Model V (see Appendix B, Table B.1.11 and Table B.1.13).

Table 5.2 Estimation Results of Model IV and Model V

Variable	Model IV	Model V
CONSTANT	2.336606** (0.08421) (27.74747)	3.240343** (0.228031) (14.21013)
T	-0.032527** (0.003739) (-8.698883)	-0.075673** (0.009977) (-7.584733)
INVD	0.002375 (0.001365) (1.73975)	-0.000918 (0.000905) (-1.013923)
EDUD	-0.015681** (0.004548) (-3.447979)	-0.004406 (0.005539) (-0.795519)
AR(1)	-	0.934867** 0.018122 51.58808
R^2	0.957397	0.985307
SSR	3.078558	0.630283

- The first parentheses under the estimated coefficients represent standard errors, and the second parentheses represent t-ratios.
- ** significant at 1%; * significant at 5%.

In order to see if there is any improvement in the results by taking heteroskedasticity into account, Model II and Model IV are compared. There are considerable changes in constant term and the coefficient of T and there are definite gains in efficiency in these coefficients when the model is corrected for heteroskedasticity. The estimated coefficients of INVD are insignificant in both models. On the other hand, the estimated coefficients of EDUD are significant in both models, whereas there is loss in efficiency in terms of t statistics in Model IV.

Equation 5.1 was also estimated by allowing cross-sectionally heteroskedastic and contemporaneously correlated residuals (cross-section SUR). Since cross section effects with cross-section SUR is not allowed with unbalanced data, it was applied to equation 5.1 without using fixed effects. Hence, it is just re-estimation of Model I allowing cross-section SUR heteroskedasticity. This specification also has given individually significant coefficient estimates with economically plausible signs. (see Appendix B, Table B.1.12). However, in order to control for individual heterogeneity, it is preferred to use specifications allowing cross section effects.

In order to see if there is any improvement in the results by taking autocorrelation into account, Model II and Model V are compared. It is seen that there is a slight increase in the constant term and a considerable increase in the coefficient of T when the model is corrected for autocorrelation. There is gain in efficiency in the estimate of the coefficient of T. However, the coefficient of EDUD, which was significant at 99% level in Model II has become insignificant in Model V.

It is also possible to add AR terms into the specification as a cross-section specific coefficient. The results of such a specification, which do not differ considerably from Model V, are given in the Appendix (see Appendix B, Table B.1.14).

Evaluating the results of Model IV and Model V, it is seen that there are some distortions in the estimates of the constant term, coefficients of T and EDUD when the model is corrected for autocorrelation. Therefore, the correction to be made for basic estimators is for heteroskedasticity, not autocorrelation (Erlat, 2006).

Estimation of Model II that is corrected for both cross-section heteroskedasticity and autocorrelation is also respresented in Appendix (see Appendix B, Table B.1.15). The estimation results of this specification are very similar to the results of Model V.

1996, the year in which Customs Union (CU) between EU-15 and Turkey was established, constitutes an important turning point in Turkey-EU relations. Trade flows are expected to increase due to the free movement of industrial goods and processed agricultural products. Moreover, as a candidate for EU membership, Turkey has integrated more to EU in the context of several economic and politic legislations. Therefore, it seems plausible to expect the results of the model studied may have significant differences before and after the establishment of CU. For this reason, equation 5.1 was estimated using cross-section fixed effects and allowing for cross-section heteroskedasticty for period 1980-1995 (Model VI) and for period 1996-2008 (Model VII) separately. The equation was also estimated for the whole period but using Custom Union (CU) dummy variable that is 1 for the years after 1995 and 0 otherwise (Model VIII). Table 5.3 contains the estimation results of Model VI, Model VII and Model VIII (see Appendix B, Table B.1.16, Table B.1.17 and Table B.1.18).

Both of the estimates of Model VI and Model VII result in individually significant coefficients. Constant term has increased in the second period. The coefficient of T is negative in both models, confirming the predictions of convergence theory. In absolute terms, the value of the coefficient has increased considerably for the second period, implying an increased affect of trade on the convergence process.

The coefficient of education expenditure is negative in both models, and the absolute value of the coefficient has increased for the second period. Hence, an increase in the difference of education expenditures leads to a decrease in the difference of per capita incomes, and the affect of EDUD on YD gets stronger after the CU. On the other hand, the coefficient of investment share is negative and significant for 1980-1995, while it is positive and significant for 1996-2008.

Table 5.3 Estimation Results of Model VI, Model VII and Model VIII

Variable	Model VI 1980-1995	Model VII 1996-2008	Model VIII
CONSTANT	2.567459** (0.075447) (34.02976)	3.896624** (0.25854) (15.07166)	2.555252** (0.11463) (22.29136)
T	-0.044019** (0.00371) (-11.8647)	-0.10312** (0.011205) (-9.202893)	-0.044362** (0.005647) (-7.85525)
INVD	-0.00602** (0.001092) (-5.514063)	0.014633** (0.001764) (8.297375)	0.002392 (0.001362) (1.756229)
EDUD	-0.011796** (0.003644) (-3.237486)	-0.048531** (0.010761) (-4.509947)	-0.01272** (0.004672) -2.722653
CU	-	-	0.034915** (0.012691) (2.75111)
R^2	0.979522	0.980748	0.957768
SSR	0.573299	0.724044	2.981226

- The first parentheses under the estimated coefficients represent standard errors, and the second parentheses represent t-ratios.
- ** significant at 1%; * significant at 5%.

Estimation results for two separate periods show that, the model fits data better for the second period (1996-2008). The bilateral trade effect on lowering the difference of two countriesô GDP per capita is higher in the second period. In the period 1980-1995, 1 per cent increase in trade volume lowers per capita income difference by 0.044 per cent, whereas in the period 1996-2008, 1 per cent increase in trade volume lowers per capita income difference by 0.1 per cent.

The results of Model VIII confirm that, the coefficient of CU dummy variable is significant at 99% level, bringing a small increase in constant term after 1996.

The coefficient of INVD, which was significant both in Model VI and Model VII, is insignificant in Model VIII. The effect of INVD on YD was estimated negative for period 1980-1995 and positive for period 1996-2008, hence increase in INVD decreases YD in 1980-1995, while the reverse is true for 1996-2008. These two different effects make it insignificant when the whole period (1980-2008) is analyzed.

5.1.2 Discussion

In all of the models estimated, the coefficient of the trade term is negative supporting the idea that trade have a negative effect on per capita income differences: trade causes convergence.

Although EU-15 countries can perceived as homogeneous in many aspects, because of the nature of the panel data, the presence of significant heterogeneity in the intercept term of our model seems plausible. Considering the structure of the data that consists of a specific group of countries which Turkey has special relations with, it is more appropriate to use fixed effects rather than random effects model, which is also confirmed by the redundant fixed effects test.

Putting its crucial advantage of taking into account of country-pair heterogeneity aside, using fixed effects model cause time invariant variables to be taken out of the equation -initial per capita income difference-, which is significant in explaining current per capita income differences.

For the sake of econometric concerns, the model is corrected for cross-section heteroskedasticity.

The results of the model for 1980-1995 and for 1996-2008 is coherent, however the effect of trade on narrowing per capita income difference is higher for the second period (1996-2008): CU has strengthened the link between trade and convergence.

It is found that, the difference in education expenditure has a negative effect on per capita income difference: when the difference of two countriesô education expenditure increases, the difference of per capita income decreases. Education expenditure in the model exists for indicating human capital. The difference of two countriesô education expenditure may be perceived as technological gap, hence when the gap is bigger it is easier and faster for the lagging country to catch up the leading one. Therefore, dissimilarity of human capital in favour of EU-15 countries provides Turkey an advantage in converge to these countries in terms of per capita income, since she can use the technology that has already been produced.

The effect of investment share on per capita income difference is negative for the period 1980-1995 and positive for the period 1996-2008. An explanation of this change in the effect of investment difference may be that there has been a structural change in the second half of 1990s in this relationship.

We could argue that in the first period, the difference in two countriesô investment share acts as a catalyst for convergence process: when INVD increases, YD decreases. Since the marginal product of physical capital is higher in the lagging country due to the low investment share comparatively, the difference in investment shares contributes to the convergence process similar to the difference in education expenditures.

However, after the establishment of the CU, Turkey becomes more and more integrated to the EU by harmonizing many standards and technical regulations in terms of international trade, as well as international capital flows. This period also corresponds to financial liberalization period of Turkey; after the financial account liberalization in 1989, and increased integration with EU after the CU give Turkey the chance to attract more capital inflows from EU countries, as well as other developed countries. Hence, investments began to be driven by international financial market conditions and not confined to the domestic savings. Therefore, in this period the effect of the difference in investment shares on convergence works through the savings channel as expected in the theoretical model. After the CU, the difference in investment shares and per capita income difference have a positive relation: YD increases as INVD increases.

5.2 Trade Equation

The baseline trade equation has a log-linear gravity form:

$$T_{jt} = \beta_0 + \beta_1 \, YD_{jt} + \beta_2 \, GDPT_{jt} + \beta_3 \, D_j + \beta_4 \, TRPOP + \mu_{jt} \qquad (5.2)$$

where “T_{jt}” is the trade volume (exports+imports) between Turkey and country j at time t, “YD_{jt}” is the absolute value of the difference in log of Turkey’s per capita income and log of country j’s per capita income at time t, “$GDPT_{jt}$” is the sum of log of Turkey’s total GDP and log of country j’s total GDP at time t, “D_j” is the great circle distance between Ankara and country j’s capital and “TRPOP” is the dummy variable representing EU-15 countries that Turkish population is over %1 of total population of that country. Hence, it takes the value 1 for Austria, Denmark, Germany and Netherlands, and takes the value 0 otherwise (See Appendix C).

Before estimating the equation, the stationarity of the variables have been checked. As mentioned in the convergence equation, variables YD and T were found to be I(1). Panel unit root tests were performed for GDPT, and it was also found to be I(1) (see Appendix B, Table B.2.1).

Pedroni panel cointegration test (Engle-Granger based) was performed for these variables (see Appendix B, Table B.2.2). From seven test statistics, which evaluate the null against both the homogenous and heterogeneous alternatives (within and between dimensions), five of the statistics do not reject the null of “no cointegration”.

5.2.1 Results of Estimations

Equation 5.2 has estimated with Pooled Least Squares (PLS), with cross-section fixed effects (FE) and with cross-section random effects (RE), which are named Model IX, Model X and Model XI respectively. Table 5.4 contains estimation results of these models (see Appendix B, Table B.2.3, Table B.2.4 and Table B.2.5).

Table 5.4 Estimation Results of Model IX, Model X and Model XI

Variable	Model IX PLS	Model X FE	Model XI RE
CONSTANT	-44.20716** (1.376803) (-32.10856)	-83.0213** (1.196063) (-69.41215)	-75.45199** (2.207679) (-34.17707)
YD	0.097836 (0.093709) (1.044044)	0.047832 (0.134557) (0.355482)	-0.018561 (0.123549) (-0.150234)
GDPT	1.314852** (0.024345) (54.00891)	1.971251** (0.021969) (89.72762)	1.922771** (0.021293) (90.30223)
D	-0.634752** (0.082354) (-5.939178)	-	-0.691941* (0.267237) (-2.589241)
TRPOP	0.137252* (0.068944) (1.990771)	-	0.033271 (0.212565) (0.156521)
R^2	0.885692	0.978786	0.944609
SSR	132.9432	24.67211	30.71647

- The first parentheses under the estimated coefficients represent standard errors, and the second parentheses represent t-ratios.
- ** significant at 1%; * significant at 5%.

Fixed effects specification is not allowed with time invariant variables (D and TRPOP), therefore these variables are left out from the equation when estimating Model X.

In all three estimations, the coefficient of YD is insignificant in explaining trade. In terms of D and GDPT variables, estimation results are economically plausible. Distance has a negative effect on trade volume as expected. 1 per cent increase in distance lowers trade by 0.63 per cent according to Model IX and by 0.69 per cent according to Model XI. GDPT has a positive impact on trade volume as well. When the sum of total GDPs of two countries increases 1 per cent, bilateral trade volume increases by 1.3 per cent, 2 per cent and 1.9 percent according to Model IX, X and XI respectively. The coefficient of TRPOP is only significant in Model IX at 95% level, and the sign of the coefficient is positive as expected.

Since our panel data does not consist of randomly selected countries, fixed effects model is more appropriate. Redundant Fixed Effects Test, which is applied on Model X, has also confirmed that fixed effects are significant (see Appendix B, Table B.2.6). Random effects model is shown for comparison. Model XI was estimated using Swamy and Arora (SA) approach. Wallace and Hussain (WH) approach, which is represented in Appendix, has given very similar results to SA except the estimate of coefficient of per capita income difference. Estimation of Model XI by WH approach gives negative coefficient for per capita income difference; however it is again insignificant in explaining trade (see Appendix B, Table B.2.7).

Due to the concerns that have been mentioned when analyzing income dispersion equation, equation 5.2 was estimated by Pooled Generalized Least Squares (PGLS) taking into account for cross-section heteroskedasticity (Model XII) and taking into account for autocorrelation (Model XIII). The estimation results of these models are given in Table 5.5 (see Appendix B, Table B.2.8 and Table B.2.10).

Examination of the results of Model XII shows that, when the model is corrected for cross-section heteroskedasticity, the coefficient of YD becomes significant in explaining trade with a negative sign. On the other hand, the coefficient of GDPT remains unchanged in terms of sign and value.

Equation 5.2 was also estimated by allowing cross-sectionally heteroskedastic and contemporaneously correlated residuals. Since cross-section effects with cross-section SUR weights are not allowed with unbalanced data, it is just re-estimation of Model IX allowing cross-section SUR heteroskedasticity (see Appendix B, Table B.2.9). The results of this specification have given individually significant coefficient estimates with economically plausible signs. However, it was preferred to use specifications allowing cross-section effects due to the concerns that are noted previously.

Table 5.5 Estimation Results of Model XII and Model XIII

Variable	Model XII	Model XIII
CONSTANT	-79.25197** 1.12504 -70.44371	-81.27469** 2.780196 -29.23343
YD	-0.363727** 0.125124 -2.906934	-0.460049* 0.192117 -2.394634
GDPT	1.91224** 0.019491 98.11041	1.953604** 0.051476 37.95178
AR(1)	-	0.695897** 0.035308 19.7094
R^2	0.985126	0.989668
SSR	23.808	11.17617

- The first parentheses under the estimated coefficients represent standard errors, and the second parentheses represent t-ratios.
- ** significant at 1%; * significant at 5%.

Model XIII is the re-estimation of Model X correcting for autocorrelation, where AR (1) term was added to the specification as a common coefficient. When the two models are compared, the estimated constant term and the coefficient of GDPT seem unchanged; however there are no gains in efficiency. The coefficient of YD is insignificant -but positive- in Model X, whereas it is significant at 95% level and negative in Model XIII.

It is also possible to add AR terms as a cross-section specific coefficient. The results of such a specification are contained in Appendix (see Appendix B, Table B.2.11). The results do not differ considerably from Model XIII.

For the sake of comparison, re-estimation of Model X allowing for both cross-section heteroskedasticity and common AR terms specification is presented in Appendix (see Appendix B, Table B.2.12).

The estimations results of trade equation show that there is significant change, in estimate of coefficient of YD, when the basic model is corrected for heteroskedasticity and autocorrelation. Although Model XII and XIII give similar coefficient estimates in all variables, Model XIII yield some distortions in terms of t statistics. Therefore, Model XII is preferred, and the basic model is corrected for cross-section heteroskedasticity not for autocorrelation.

In this framework, Model XII was estimated for periods 1980-1995 (Model XIV) and 1996-2008 (Model XV) separately and whole period but using CU dummy variable (Model XVI) in order to detect whether CU has an impact on results of the model. Table 5.6 contains the estimation results of these models (see Appendix B, Table B.2.13, Table B.2.14 and Table B.2.15).

Table 5.6 Estimation Results of Model XIV, Model XV and Model XVI

Variable	Model XIV 1980-1995	Model XV 1996-2008	Model XVI
Constant	-77.42701** (1.699743) (-45.55218)	-73.83104** (2.074512) (-35.5896)	-78.53025** (1.864779) (-42.11237)
YD	-0.388302* (0.192925) (-2.012708)	-0.694306** (0.126107) (-5.505681)	-0.368568** (0.125981) (-2.925589)
GDPT	1.877582** (0.028692) (65.43864)	1.820507** (0.037848) (48.10078)	1.898468** (0.034455) (55.10016)
CU	-	-	0.018907 (0.036369) (0.519866)
R^2	0.991073	0.988181	0.985068
SSR	12.02343	4.023943	23.78137

- The first parentheses under the estimated coefficients represent standard errors, and the second parentheses represent t-ratios.
- ** significant at 1%; * significant at 5%.

There is not a significant change in constant term and the coefficient of GDPT in two separate periods. 1 per cent change in this variable increases trade volume by 1.88 and 1.82 in Model XIV and Model XV respectively.

In 1980-1995 period, the coefficient of YD is significant at 95% level in explaining trade: 1 per cent increase in per capita income difference of two countries decreases bilateral trade volume by 0.39 per cent. After the establishment of CU, in the period 1996-2008, the coefficient of YD is significant at 99% level, and the absolute value of the coefficient increases to 0.69 while the sign of it remains unchanged. Hence, after CU the link from convergence to trade has strengthened.

In Model XVI, the coefficient of CU dummy variable has been found insignificant. Since, constant term does not change considerably before and after CU, using intercept time dummy variables do not provide any gains to the model.

5.2.2 Discussion

The estimations with PLS, PLS with cross-section fixed effects and Pooled EGLS with cross-section random effects has given insignificant coefficient estimates of per capita income difference. The total GDP term is significant in explaining trade in all three models with a positive sign which is economically plausible. The coefficient estimates of distance variable in PLS and RE models are significant at 99% level with a negative sign as expected. However, the coefficient of dummy variable was found insignificant in both models, and has been left out from the model henceforth.

The estimations show that per capita income difference is irrelevant in explaining trade, whereas the results change drastically when the model is corrected for cross-section heteroskedasticity. By economic intuition fixed effects model is more convenient than random effects model since our cross section identifiers constitute a special group rather than a randomly selected sample. Estimation results in this context affirm that per capita income difference is significant at 99% level in explaining trade: 1 per cent increase in per capita income difference of two countries lowers bilateral trade volume by 0.36 per cent.

Analysis of time period in two separate parts (1980-1995 and 1996-2008) shows that, per capita income difference is significant in explaining trade in both periods with a negative sign. Moreover, the absolute value of the coefficient increases for the second period. Hence, similarities rather disparities drive trade: Per capita income convergence cause trade and its effect gets stronger after the CU.

5.3 Simultaneous Equations

Although results of estimations of equation 5.1 and 5.2 are consistent with economic intuition, in order to avoid misleading inferences it is necessary to examine these two equations as a system. Since the dependent variable in income dispersion equation enters in trade equation as explanatory variable and vice versa, it is possible to have endogeneity problem in the equations. As a result, it is not possible to get robust interpretations about the direction of causality between trade and per capita income differences. ñé .if higher trade causes smaller income differences, then income differences may be significant in a trade regression, even if this is not the correct direction of causalityò (Cyrus, 2004).

ñEndogeneity causes inconsistency of the usual OLS estimates and requires instrumental variable methods like two stage least squares (2SLS) to obtain consistent parameter estimatesò (Baltagi, 2001).

The Hausman Simultaneity Tests have been applied to these equations following a two step procedure between two endogenous variables ïYD and T- (Hausman, 1978). For income dispersion equation, in the first step, T has been regressed with the exogenous and predetermined variables of the system (GDPT, D, Y80D, INVD and EDUD), and the residuals of this estimations have been obtained (R1). In the second step, YD has been regressed with the usual explanatory variables and R1. In this estimation, the coefficient of R1 was found significant at 99% level. (see Appendix B, Table B.3.1.1 and Table B.3.1.2).

For trade equation, in the first step, YD has been regressed with the exogenous and predetermined variables of the system (GDPT, D, Y80D, INVD and EDUD), and the residuals of this estimations have been obtained (R2). In the second step, T has been regressed with the usual explanatory variables and R2. In this estimation, the coefficient of R2 was found insignificant (see Appendix B, Table B.3.1.3 and Table B.3.1.4).

Taking these two equations as a system, the null hypothesis of simultaneity was accepted due to the estimated coefficient of R1 in income dispersion equation, which was statistically significant.

Hence, in order to take into account simultaneity and avoid the problems of endogeneity, equation 5.1 and 5.2 were estimated using instrumental variable method. Explanatory variables in trade regression other than per capita income difference were used as instruments for trade in income dispersion equation, and explanatory variables in income dispersion equation except trade were used as instruments of per capita income difference in trade equation.

5.3.1 Income Dispersion Equation

In estimating income dispersion equation by instrumental variables method, it is intented to use D and GDPT as instruments of T. However, POPT have been used rather than GDPT, in order to avoid same endogeneity problems that YD deals with. In addition, for econometric concerns, right hand side variables in income dispersion equation that are not correlated with disturbances (EDUD, INVD and Y80D) have also been added to the instruments list.

On the other hand, since fixed effects specification does not allow for time invariant variables, D could not be included. For that reason, one lagged value of T, which is denoted by T(-1), has been added to the instrument list in fixed effects specifications.

Equation 5.1 has estimated with Pooled Instrumental Variables (IV), with cross-section fixed effects (IV-FE) and with cross-section random effects (IV-RE), which are named Model XVII, Model XVIII and Model XIX respectively. Table 5.7 contains estimation results of these models (see Appendix B, Table B.3.1.5, Table B.3.1.6 and Table B.3.1.7).

The results are very similar to Pooled Least Squares estimation results. In all three models, the coefficient of T is significant at 99% level, and sign of the coefficient is negative that confirms the affect of trade on narrowing income differences.

Table 5.7 Estimation Results of Model XVII, Model XVIII and Model XIX

Variable	Model XVII IV	Model XVIII IV-FE	Model XIX IV-RE
CONSTANT	0.416474** (0.137178) (3.036018)	2.041013** (0.12474) (16.36219)	0.527954** (0.196808) (2.682585)
T	-0.025604** (0.007487) (-3.419872)	-0.017365** (0.005487) (-3.16497)	-0.031919** (0.007189) (-4.440125)
Y80D	1.02448** (0.033028) (31.0182)	-	1.069299** (0.08924) (11.98224)
INVD	0.005781* (0.00258) (2.240754)	0.002886 (0.001944) (1.484509)	0.002874 (0.001946) (1.47668)
EDUD	-0.013852 (0.007997) (-1.732256)	-0.023211** (0.006671) (-3.479233)	-0.033242** (0.007478) (-4.445117)
R^2	0.853342	0.92591	0.254914
SSR	6.553323	3.168495	3.416853

- The first parentheses under the estimated coefficients represent standard errors, and the second parentheses represent t-ratios.
- ** significant at 1%; * significant at 5%.

For the reasons stated above, fixed effects model is selected. Hence, time invariant variable "Y80D", which is significant in explaining current income differences in Model XVII and Model XIX, is left out from the regression.

Model XVIII is corrected for heteroskedasticity (Model XX) and autocorrelation (Model XXI) separately. Table 5.8 illustrates the result of these models. In Model XX cross-section heteroskedasticity, which allows for a different residual variance for each cross section, is considered. In Model XXI, in order to correct for autocorrelation, which is also indicated by low DW statistic in Model XVIII, AR(1) term has been added to the specification as a common coefficient (see Appendix B, Table B.3.1.8 and Table B.3.1.9).

Table 5.8 Estimation Results of Model XX and Model XXI

Variable	Model XX	Model XXI
CONSTANT	2.275559** (0.092327) (24.64667)	3.134906** (0.496645) (6.312163)
T	-0.029862** (0.004099) (-7.284812)	-0.071014** (0.022108) (-3.212112)
INVD	0.002206 (0.001391) (1.585341)	-0.000927 (0.000908) (-1.020925)
EDUD	-0.013915** (0.00473) (-2.941777)	-0.004736 (0.005667) (-0.835588)
AR(1)	-	0.931651** (0.020564) (45.30449)
R^2	0.958049	0.985299
SSR	2.952677	0.710323

- The first parentheses under the estimated coefficients represent standard errors, and the second parentheses represent t-ratios.
- ** significant at 1%; * significant at 5%.

The results from Model XX show that, when the model is corrected for heteroskedasticity, there are definite gains in efficiency in constant term, and the coefficient of T, comparing to Model XVIII. The coefficient of INVD is insignificant like in Model XVIII, and there is a slight loss in efficiency in the coefficient of EDUD, however, it is again significant at 99% level in explaining per capita income differences.

Model XVII was also estimated by correcting for cross-sectionally heteroskedastic and contemporaneously correlated residuals (cross-section SUR). Since cross section effects with cross-section SUR is not allowed with unbalanced data, it was applied without fixed effects (see Appendix B, Table B.3.1.10). The results of this specification have given individually significant coefficient estimates with economically plausible signs. However, it was preferred to use specifications allowing cross-section effects due to the concerns that are noted previously.

The results of Model XXI show that, when Model XVIII is corrected for autocorrelation, there are losses in efficiency in terms of t statistics. Although the constant term, the coefficient of T and AR(1) terms are significant at 99%, the coefficient of EDUD becomes insignificant.

Estimation of Model XVIII that is corrected for both cross-section heteroskedasticity and autocorrelation is also represented in Appendix (See Appendix B.3.1.11).

Model XX, which is the re-estimation of Model XVIII for correcting heteroskedasticity provides more convenient and robust results, is chosen. Hence, T and YD have a negative relationship: 1 per cent increase in bilateral trade decreases per capita income difference by 0.03 per cent. EDUD and YD have a negative relationship, as well. 1 unit change in the difference of education expenditures (as a percentage of GNI) leads 0.014 per cent change in per capita income differences. On the other hand, INVD is irrelevant in explaining YD.

Model XX was estimated for the period 1980-1995 (Model XXII) and for the period 1996-2008 (Model XXIII) separately in order to search for the effect of establishment of the CU. Model XX was also estimated for the whole period, but with using CU dummy variable , which is 1 for 1996 and thereafter and 0 otherwise (Model XXIV). Table 5.9 represents the result of these estimations (see Appendix B, Table B.3.1.12, Table B.3.1.13 and Table B.3.1.14).

Estimation results of Model XXII, and Model XXIII are similar to the ones that have obtained from PLS method. Both of the models result in individually significant coefficients. Constant term has increased in the second period. The coefficient of T is negative in both models, and in absolute terms, it has increased in the second period.

The coefficient of EDUD is negative in both models, absolute value of the coefficient has increased for the second period. On the other hand, the coefficient of INVD is negative for 1980-1995 but it is positive for 1996-2008.

Table 5.9 Estimation Results of Model XXII, Model XXIII and Model XXIV

Variable	Model XXII 1980-1995	Model XXIII 1996-2008	Model XXIV
CONSTANT	2.556142** (0.085618) (29.85502)	3.662727** (0.285899) (12.81126)	-0.27167 (0.84834) (-0.320237)
T	-0.043479** (0.004195) (-10.36419)	-0.093154** (0.012399) (-7.512909)	0.106538* (0.045046) (2.365087)
INVD	-0.006609** (0.00109) (-6.061191)	0.015135** (0.001843) (8.212653)	0.001617 (0.002743) (0.589421)
EDUD	-0.011635** (0.003606) (-3.226808)	-0.040713** (0.011435) (-3.560197)	-0.044892** (0.012595) (-3.564338)
CU	-	-	-0.364662** (0.124374) (-2.931992)
R^2	0.979073	0.979837	0.857051
SSR	0.517919	0.77292	2.508049

- The first parentheses under the estimated coefficients represent standard errors, and the second parentheses represent t-ratios.
- ** significant at 1%; * significant at 5%.

Estimation results of these two models show that, similar to PLS estimations, trade effect on narrowing per capita income differences is higher for the second period: CU has a positive effect on trade and convergence relation.

However, when the model is estimated for the whole period (1980-2008) using CU dummy variable, the results change significantly. Although, CU dummy variable is significant at 99% level, there are losses in efficiency for all coefficients except EDUDôs.

5.3.2 Trade Equation

In estimating trade equation by instrumental variables method, EDUD, INVD and Y80D were used as instruments of per capita income difference. Once more, for econometric concerns, right hand side variables in trade equation that are not correlated with disturbances (distance and the sum of two countriesô log of total GDP) have also been added to the instruments list.

Once more, since fixed effects model does not allow for time invariant variables, Y80D could not be included. For that reason, one lagged value of YD, which is denoted as YD(-1), has been added to the instrument list in fixed effects specifications.

Equation 5.2 has estimated with Pooled Instrumental Variables (IV), with cross-section fixed effects (IV-FE) and with cross-section random effects (IV-RE), which are named Model XXV, Model XXVI and Model XXVII respectively. Table 5.10 contains estimation results of these models (see Appendix B, Table B.3.2.1, Table B.3.2.2 and Table B.3.2.3).

Once more, the results are very similar to the ones from PLS estimation. In all three models, estimates of coefficients of D and GDPT are economically plausible. When the distance between two countries increases 1 per cent, bilateral trade volume decreases 0.66 per cent according to Model XXV and Model XXVII. GDPT effects T positively: if the sum of total GDPs increases 1 per cent, trade volume increases by 1.3, 2, and 1.9 per cent according to Models XXV, XXVI and XXVII respectively. On the other hand, in all three estimations, YD is insignificant in T.

Table 5.10 Estimation Results of Model XXV, Model XXVI and Model XXVII

Variable	Model XXV IV	Model XXVI IV-FE	Model XXVII IV-RE
CONSTANT	-44.12667** (1.381542) (-31.94015)	-83.14678** (1.221708) (-68.0578)	-73.84398** (2.225146) (-33.18612)
YD	0.152492 (0.092976) (1.64012)	0.114719 (0.152381) (0.75284)	-0.497183 (0.261284) (-1.902845)
GDPT	1.316406** (0.024465) (53.80701)	1.971546** (0.022435) (87.87951)	1.903437** (0.023467) (81.11173)
D	-0.664573** (0.081236) (-8.180739)	-	-0.66362** (0.255145) (-2.600954)
R^2	0.884549	0.979219	0.939998
SSR	134.5269	22.42291	32.212

- The first parentheses under the estimated coefficients represent standard errors, and the second parentheses represent t-ratios.
- ** significant at 1%; * significant at 5%.

Since our panel data focuses on a specific group of countries rather than randomly selected ones, fixed effects model (Model XXVI) is chosen. Therefore, Model XXVI is corrected for cross-section heteroskedasticity (Model XXVIII) and for autocorrelation (Model XXIX) separately. Table 5.11 illustrates the estimation result of these models (see Appendix B, Table B.3.2.4 and Table 3.2.5).

Unlike the results from PLS estimations, correcting the model neither for cross-section heteroskedasticity nor autocorrelation gave significant coefficient estimates of YD.

Table 5.11 Estimation Results of Model XXVIII, Model XXIX and Model XXX

Variable	Model XXVIII	Model XXIX	Model XXX
CONSTANT	-80.32528** 1.214274 -66.15089	-81.72122** 2.849297 -28.68119	-72.7886** (2.827873) (-25.7397)
YD	-0.169461 0.1506 -1.125239	-0.348422 0.277067 -1.257535	-0.69286** (0.226311) (-3.06154)
GDPT	1.92664** 0.020657 93.26716	1.958657** 0.051447 38.07141	1.799559** (0.05006) (35.94793)
AR(1)	-	0.690981** 0.035763 19.32102	0.71963** (0.03417) (21.06042)
R^2	0.985043	0.989659	0.992522
SSR	21.95486	11.29976	11.04768

- The first parentheses under the estimated coefficients represent standard errors, and the second parentheses represent t-ratios.
- ** significant at 1%; * significant at 5%.

The fourth column of Table 5.11 gives the estimation results of Model XXX, which is the re-estimation of Model XVI correcting for both heteroskedasticity and autocorrelation. The coefficient estimate of YD has become significant when the both corrections have been made to the model. According to this model, YD effects T in a negative way, confirming Linderô s hypothesis, that is 1 per cent increase in two countriesô per capita income difference decreases trade volume by 0.7 per cent (see Appendix B, Table B.3.2.6).

Since significant coefficient estimate of YD has only been obtained by Model XXX, this model was estimated for periods 1980-1995 (Model XXXI) and 1996-2008 (Model XXXII) separately in order to see the impact of the CU. Model XXX was also estimated for the whole period but with using CU dummy variable that takes the value 1 for the years after 1995 and 0 otherwise. Table 5.12 demonstrates the results of these models (see Appendix B, B.3.2.7, Table B.3.2.8 and Table B.3.2.9).

Estimations of Model XXXI and Model XXXII show that, these two periods denominate important differences. The estimated constant term is significant and negative, and it is almost same in terms of value in both periods. The estimated coefficients of the GDPT are also significant and positive in both periods: 1 per cent increase in total GDP variable leads to an increase in trade volume by 1.85 per cent. However, the coefficient of YD, which is significant at 99% level with a negative sign in the first period, has become insignificant in the second period. 1 per cent increase in per capita income difference of two countries causes 1.5 per cent decrease in bilateral trade volume in period 1980-2008. However, after the establishment of CU income difference variable loses its effect and becomes irrelevant in explaining trade.

Table 5.12 Estimation Results of Model XXXI, Model XXXII and Model XXXIII

Variable	Model XXXI 1980-1995	Model XXXII 1996-2008	Model XXXIII
CONSTANT	-74.26282** (3.279531) (-22.64434)	-75.57952** (5.158827) (-14.65052)	-128.7933** (27.92318) (-4.612416)
YD	-1.526467** (0.361069) (-4.227634)	-0.441919 (0.251949) (-1.754)	-0.505763 (0.456153) (-1.108758)
GDPT	1.852863** (0.058074) (31.90503)	1.845459** (0.092086) (20.04056)	2.870237** (0.535506) (5.35986)
AR(1)	0.483677** (0.060972) (7.932739)	0.605823** (0.06324) (9.579701)	0.746919** (0.038227) (19.53914)
CU	-	-	-1.231533 (0.678286) (-1.815653)
R^2	0.991078	0.992676	0.975639
SSR	7.136031	2.704178	10.28467

• The first parentheses under the estimated coefficients represent standard errors, and the second parentheses represent t-ratios.
• ** significant at 1%; * significant at 5%.

On the other hand, according to Model XXXIII, YD is insignificant in explaining T, as well as CU dummy variable. It is unexceptional due to the structural change that comes with CU.

5.3.3 Discussion

Two equations studied in this thesis might constitute a system, since the dependent variable of each equation enters as an explanatory variable in other equation. Hausman Test also supports the simultaneity of these two equations. Therefore, it is plausible to expect inconsistency of the Least Squares estimates, and Instrumental Variables method is convenient since it takes simultaneity into account and enables us to conceive the way of causality.

For income dispersion equation, the results from IV method give very similar results to PLS method. In all the models estimated, the coefficient of the trade term is negative supporting the hypothesis that trade causes convergence.

As usual, fixed effects model is preferred since the characteristics of selected countries, however, it is also important to note that time invariant variable-which is initial per capita income difference- is found significant in explaining current per capita income difference.

The effect of trade on income differences increase after the establishment of CU. Hence, CU strengthens the negative link from trade to convergence.

The difference in education expenditure has a negative effect on per capita income difference. Since Turkeyös education expenditure is lower than all the countries of EU-15 in the selected period, the result shows that, the difference in education expenditure as a human capital indicator provides Turkey an advantageous position to catch up EU-15 in terms of per capita income.

Estimation results give conflicting results about the effect of investment share again. For 1980-1995, it is found to be negative and for 1996-2008 it is found to be positive. For the selected period as a whole, it is insignificant in explaining income difference due to the possible structural break of CU.

For trade equation, the results of IV method differs from PLS method in various ways. Although the coefficient estimates of distance and the sum of total GDPs are very similar to the ones from PLS models, IV estimations do not give significant coefficient estimate of income difference unless it is not corrected for both cross-section heteroskedasticity and autocorrelation.

Moreover, it is found that, income difference effects trade negatively for the period 1980-1995, which supports Linderȏs hypothesis. However, it is insignificant for the second period. The difference in per capita income against Turkey has a negative effect on trade in the first period. However, after the establishment of CU, the regulations within the member countries and harmonization of Turkey to the EU countries remove the negative effect of income difference on trade: CU bring different means and dynamics to trade.

CHAPTER VI

CONCLUDING REMARKS

In this thesis, the relation between international trade and per capita income convergence was analyzed for Turkey and EU-15 countries for the period 1980-2008. Within the panel data approach two equations were estimated: an income dispersion equation for analyzing the effect of trade on per capita income convergence and a gravity model of trade for analyzing per capita income difference on trade. First, the equations were estimated separately using Pooled Least Squares (PLS) method, and then Instrumental Variables (IV) method was utilized in order to take these equations as a system and to avoid the problem of endogeneity.

Additionally, taking into consideration that, Customs Union (CU) may lead structural differences in both directions of the relation that is considered -from trade to convergence and from convergence to trade-, data set has also been divided in two periods, before and after CU, and estimated separately for these periods.

Both estimation methods show that, trade reduces income difference for our data set: 1 per cent increase in bilateral trade volume brings about 0.03 per cent decrease in per capita income difference for the whole period. Moreover, tradeǿs effect on narrowing income differences significantly increases after the establishment of CU. Increasing trade between Turkey and EU-15 countries leads Turkey to converge them in terms of per capita GDP. CU strengthens the link between trade and converge: the coefficient of trade term becomes more than twice as big compared to the coefficient before CU period in absolute terms. When the model is estimated for 1980-1995 period, coefficient of trade term is found as -0.04 whereas, for 1996-2008 it is found as about -0.1.

Initial income difference is found significant in explaining current income differences: If the initial per capita income difference between Turkey and EU-15 countries were higher by 1 per cent, the current income difference would also be higher by about 1 per cent.

The absolute difference in education expenditure as a percentage of Gross National Income (GNI) effects income difference negatively. Taking into account that Turkey has lower education expenditure (% of GNI) compared to all of EU-15 countries except Greece, the difference in education expenditure, which might be interpreted to represent a technological gap, gives Turkey an advantageous position to converge to that countries in terms of per capita GDP. 1 per cent increase in difference of education expenditure decreases the income difference by 0.015 per cent. The effect gets stronger after CU, as well.

On the other hand, the absolute difference in investment share as a percentage of Gross Domestic Product (GDP) is found to effect income difference negatively before CU and positively after CU, indicating a structural change in the second half of 1990s in this relationship.

In the first period, since the marginal product of physical capital is higher in the lagging country due to the low investment share comparatively, the difference in two countriesô investment share acts as a catalyst for convergence process. However, after the financial account liberalization in 1989, and increased integration with EU after the CU give Turkey the chance to attract more capital inflows from EU countries, as well as other developed countries. Hence, investments began to be driven by international financial market conditions and not confined to the domestic savings. Therefore, in this period the effect of the difference in investment shares on convergence works through the savings channel as expected in the theoretical model: per capita income difference increases as the difference in investment shares increases.

Results from income dispersion equation are robust to the estimation technique. However, estimation results from trade equation show significant dissimilarities according to the methods used. PLS method indicates that absolute value of per capita income difference of Turkey and EU-15 countries is significant in explaining bilateral trade with a negative sign: income convergence increases bilateral trade for our dataset. Moreover, this effect gets stronger after the establishment of CU. 1 per cent decrease in income difference leads 0.4 per cent increase of trade before CU whereas it leads 0.7 per cent increase of trade after CU.

On the other hand, IV method shows that, income difference is significant in explaining trade only when the model is corrected for heteroskedasticity and autocorrelation. In addition, separate estimations for periods 1980-1995 and 1996-2008 show that, before CU, income difference is significant in explaining trade with a negative sign, supporting Linderǿs theorem. The effect is drastically bigger than the PLS estimation: 1 per cent decrease in income difference leads to 1.53 per cent increase in trade volume. Whereas it is insignificant after the CU. CU brings different dynamics to trade: Income convergence is irrelevant in explaining trade anymore.

In terms of traditional gravity variables such as distance and size, both methods give very similar results. Distance effect trade negatively: 1 per cent increase in distance between Turkey and EU-15 countries decreases trade by about 0.6 per cent. Total GDPs effects trade positively: 1 per cent increase in total GDPs increases trade by nearly 1.9 per cent, and the effect does not change significantly before and after CU.

Overall findings of this study give strong evidence for the hypothesis that trade causes convergence, and weaker support for the thesis that convergence causes trade for Turkey and EU-15 and for the period 1980-2008. Increasing trade between Turkey and EU-15 leads Turkey to converge those countries in terms of per capita GDP. However, the results do not comprise strong support for the effect of convergence on increasing bilateral trade volume.

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APPENDIX A

ABBREVIATIONS OF COUNTRY NAMES

Table A.1 Abbreviations of Country Names

AUS	Austria
BLX	Belgium and Luxembourg
DEN	Denmark
FIN	Finland
FRA	France
GER	Germany
GRE	Greece
IRE	Ireland
ITA	Italy
NET	Netherlands
POR	Portugal
SPA	Spain
SWE	Sweden
UNK	United Kingdom

APPENDIX B

ESTIMATION RESULTS

B.1 Estimation Results for Income Dispersion Equation

Table B.1.1 Unit Root Tests For ôYDô

Series: YD_AUS, YD_BLX, YD_DEN, YD_FIN, YD_FRA, YD_GER, YD_GRE, YD_IRE, YD_ITA, YD_NET, YD_POR, YD_SPA, YD_SWE, YD_UNK Sample: 1980 2008 Exogenous variables: Individual effects Automatic selection of maximum lags Automatic selection of lags based on SIC: 0 Newey-West bandwidth selection using Bartlett kernel **Pool Unit Root Test On YD?**		
Method	Statistic	Prob.
Null: Unit root (assumes common unit root process)		
Levin, Lin & Chu t*	0.90366	0.8169
Null: Unit root (assumes individual unit root process)		
Im, Pesaran and Shin W-stat	0.36435	0.6422
ADF - Fisher Chi-square	22.2122	0.7714
PP - Fisher Chi-square	24.7903	0.6392
Pool Unit Root Test On D(YD?)		
Method	Statistic	Prob.
Null: Unit root (assumes common unit root process)		
Levin, Lin & Chu t*	-18.2579	0.0000
Null: Unit root (assumes individual unit root process)		
Im, Pesaran and Shin W-stat	-15.5131	0.0000
ADF - Fisher Chi-square	236.116	0.0000
PP - Fisher Chi-square	236.244	0.0000

Table B.1.2 Unit Root Tests For ôTô

Series: T_AUS, T_BLX, T_DEN, T_FIN, T_FRA, T_GER, T_GRE, T_IRE, T_ITA, T_NET, T_POR, T_SPA, T_SWE, T_UNK Sample: 1980 2008 Exogenous variables: Individual effects Automatic selection of maximum lags Automatic selection of lags based on SIC: 0 to 4 Newey-West bandwidth selection using Bartlett kernel

Table B.1.2 Contôd

Pool Unit Root Test On T?		
Method	Statistic	Prob.
Null: Unit root (assumes common unit root process)		
Levin, Lin & Chu t*	-1.41281	0.0789
Null: Unit root (assumes individual unit root process)		
Im, Pesaran and Shin W-stat	4.01679	1.0000
ADF - Fisher Chi-square	9.02844	0.9997
PP - Fisher Chi-square	5.13752	1.0000
Pool Unit Root Test On D(T?)		
Method	Statistic	Prob.
Null: Unit root (assumes common unit root process)		
Levin, Lin & Chu t*	-22.1212	0.0000
Null: Unit root (assumes individual unit root process)		
Im, Pesaran and Shin W-stat	-21.1387	0.0000
ADF - Fisher Chi-square	317.671	0.0000
PP - Fisher Chi-square	345.175	0.0000

Table B.1.3 Unit Root Tests For ôEDUDô

Series: EDUD_AUS, EDUD_BLX, EDUD_DEN, EDUD_FIN, EDUD_FRA, EDUD_GER, EDUD_GRE, EDUD_IRE, EDUD_ITA, EDUD_NET, EDUD_POR, EDUD_SPA, EDUD_SWE, EDUD_UNK
Sample: 1980 2008
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic selection of lags based on SIC: 0
Newey-West bandwidth selection using Bartlett kernel

Pool Unit Root Test On EDUD?		
Method	Statistic	Prob.
Null: Unit root (assumes common unit root process)		
Levin, Lin & Chu t*	0.46967	0.6807
Null: Unit root (assumes individual unit root process)		
Im, Pesaran and Shin W-stat	1.51218	0.9348
ADF - Fisher Chi-square	15.2076	0.9762
PP - Fisher Chi-square	15.7913	0.9688
Pool Unit Root Test On D(EDUD?)		
Method	Statistic	Prob.
Null: Unit root (assumes common unit root process)		
Levin, Lin & Chu t*	-16.5172	0.0000
Null: Unit root (assumes individual unit root process)		
Im, Pesaran and Shin W-stat	-15.0072	0.0000
ADF - Fisher Chi-square	227.335	0.0000
PP - Fisher Chi-square	235.655	0.0000

Table B.1.4 Unit Root Tests For óINVDô

Series: INVD_AUS, INVD_BLX, INVD_DEN, INVD_FIN, INVD_FRA, INVD_GER, INVD_GRE, INVD_IRE, INVD_ITA, INVD_NET, INVD_POR, INVD_SPA, INVD_SWE, INVD_UNK		
Sample: 1980 2008		
Exogenous variables: Individual effects		
Automatic selection of maximum lags		
Automatic selection of lags based on SIC: 0 to 4		
Newey-West bandwidth selection using Bartlett kernel		
Pool Unit Root Test On INVD?		
Method	Statistic	Prob.
Null: Unit root (assumes common unit root process)		
Levin, Lin & Chu t*	-6.71256	0.0000
Null: Unit root (assumes individual unit root process)		
Im, Pesaran and Shin W-stat	-7.23932	0.0000
ADF - Fisher Chi-square	108.891	0.0000
PP - Fisher Chi-square	108.078	0.0000

Table B.1.5 Cointegration Test For óYDô, óTô and óEDUDô

Pedroni Residual Cointegration Test Series: YD? T? EDUD? Sample: 1980 2008 Included observations: 29 Cross-sections included: 14 Null Hypothesis: No cointegration Trend assumption: No deterministic trend Lag selection: Automatic SIC with max lag of 5 to 6 Newey-West bandwidth selection with Bartlett kernel					
Alternative hypothesis: common AR coefs. (within-dimension)					
		Statistic	Prob.	Weighted Sta.	Prob.
Panel v-Statistic		2.093484	0.0446	2.100709	0.044
Panel rho-Statistic		0.322966	0.3787	0.24913	0.387
Panel PP-Statistic		-0.723928	0.307	-0.782713	0.294
Panel ADF-Statistic		-0.903856	0.2652	-0.837673	0.281
Alternative hypothesis: individual AR coefs. (between-dimension)					
		Statistic	Prob.		
Group rho-Statistic		1.837484	0.0737		
Group PP-Statistic		0.117469	0.3962		
Group ADF-Statistic		-0.205303	0.3906		
Cross section specific results Phillips-Peron results (non-parametric)					
Cross ID	AR(1)	Variance	HAC	Bandwidth	Obs
_AUS	0.597	0.0012	0.001252	2	28
_BLX	0.507	0.001487	0.001455	1	24
_DEN	0.586	0.00134	0.001373	1	28

Table B.1.5 Contôd

Cross ID	AR(1)	Variance	HAC	Bandwidth	Obs
_FIN	0.596	0.001511	0.001511	0	28
_FRA	0.621	0.001248	0.001248	0	28
_GER	0.703	0.001206	0.001293	1	28
_GRE	0.791	0.001773	0.002052	3	28
_IRE	0.508	0.00299	0.00304	2	28
_ITA	0.799	0.001253	0.001457	2	28
_NET	0.509	0.001142	0.001266	1	28
_POR	0.81	0.002281	0.003579	3	28
_SPA	0.702	0.001715	0.0021	2	28
_SWE	0.721	0.001325	0.001325	0	28
_UNK	0.671	0.001287	0.001427	1	28
Augmented Dickey-Fuller results (parametric)					
Cross ID	AR(1)	Variance	Lag	Max lag	Obs
_AUS	0.597	0.0012	0	6	28
_BLX	0.507	0.001487	0	5	24
_DEN	0.586	0.00134	0	5	28
_FIN	0.596	0.001511	0	5	28
_FRA	0.621	0.001248	0	5	28
_GER	0.703	0.001206	0	5	28
_GRE	0.791	0.001773	0	5	28
_IRE	0.508	0.00299	0	5	28
_ITA	0.799	0.001253	0	5	28
_NET	0.509	0.001142	0	5	28
_POR	0.385	0.00165	3	5	25
_SPA	0.702	0.001715	0	5	28
_SWE	0.721	0.001325	0	5	28
_UNK	0.671	0.001287	0	5	28

Table B.1.6 Estimation of Model I

Dependent Variable: YD?
Method: Pooled Least Squares
Sample: 1980 2008
Included observations: 29
Cross-sections included: 14
Total pool (unbalanced) observations: 403

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	0.293443	0.100618	2.9164	0.0037
T?	-0.018576	0.005264	-3.528921	0.0005
Y80D?	1.003113	0.028746	34.89567	0.0000
INVD?	0.006188	0.002556	2.421039	0.0159
EDUD?	-0.00803	0.006662	-1.205371	0.2288

R-squared	0.853996	Mean dependent var	1.639528
Adjusted R-squared	0.852528	S.D. dependent var	0.333849
S.E. of regression	0.128205	Akaike info criterion	-1.258044

Table B.1.6 Contôd

Sum squared resid	6.541729	Schwarz criterion	-1.20843
Log likelihood	258.4959	Hannan-Quinn criter.	-1.238402
F-statistic	581.9868	Durbin-Watson stat	0.135731
Prob(F-statistic)	0.0000		

Table B.1.7 Estimation of Model II

Dependent Variable: YD?
Method: Pooled Least Squares
Sample: 1980 2008
Included observations: 29
Cross-sections included: 14
Total pool (unbalanced) observations: 403

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.075404	0.114484	18.12834	0.0000
T?	-0.018832	0.005041	-3.735759	0.0002
INVD?	0.003301	0.001925	1.714553	0.0872
EDUD?	-0.024098	0.006388	-3.772393	0.0002
Fixed Effects (Cross)				
_AUS--C	0.137317			
_BLX--C	0.399992			
_DEN--C	0.389762			
_FIN--C	0.120429			
_FRA--C	0.122335			
_GER--C	0.138029			
_GRE--C	-0.575486			
_IRE--C	-0.078015			
_ITA--C	-0.056779			
_NET--C	0.134365			
_POR--C	-0.774208			
_SPA--C	-0.444834			
_SWE--C	0.351684			
_UNK--C	0.176787			

R-squared	0.924775	Mean dependent var	1.639528
Adjusted R-squared	0.921657	S.D. dependent var	0.333849
S.E. of regression	0.093444	Akaike info criterion	-1.861642
Sum squared resid	3.370463	Schwarz criterion	-1.692953
Log likelihood	392.1209	Hannan-Quinn criter.	-1.794859
F-statistic	296.5792	Durbin-Watson stat	0.247001
Prob(F-statistic)	0.0000		

Table B.1.8. Estimation of Model III

Dependent Variable: YD?				
Method: Pooled EGLS (Cross-section random effects)				
Sample: 1980 2008				
Included observations: 29				
Cross-sections included: 14				
Total pool (unbalanced) observations: 403				
Swamy and Arora estimator of component variances				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	0.300558	0.174922	1.71824	0.0865
T?	-0.018914	0.00499	-3.790481	0.0002
Y80D?	1.031298	0.08804	11.71404	0.0000
INVD?	0.003413	0.001923	1.774996	0.0767
EDUD?	-0.023302	0.00632	-3.686927	0.0003
Random Effects (Cross)				
_AUS--C	-0.02687			
_BLX--C	0.091806			
_DEN--C	0.004249			
_FIN--C	-0.020414			
_FRA--C	-0.043445			
_GER--C	-0.006729			
_GRE--C	-0.214437			
_IRE--C	0.224015			
_ITA--C	-0.017286			
_NET--C	-0.021725			
_POR--C	0.017819			
_SPA--C	0.001429			
_SWE--C	-0.021486			
_UNK--C	0.033074			
Effects Specification				
	S.D.	Rho		
Cross-section random	0.102968	0.5484		
Idiosyncratic random	0.093444	0.4516		
Weighted Statistics				
R-squared	0.265143	Mean dependent var		0.273644
Adjusted R-squared	0.257757	S.D. dependent var		0.10898
S.E. of regression	0.093296	Sum squared resid		3.464213
F-statistic	35.90049	Durbin-Watson stat		0.240384
Prob(F-statistic)	0.0000			
Unweighted Statistics				
R-squared	0.849808	Mean dependent var		1.639528
Sum squared resid	6.729348	Durbin-Watson stat		0.123748

Table B.1.9 Estimation of Model III (Wallace and Hussain Approach)

Dependent Variable: YD?
Method: Pooled EGLS (Cross-section random effects)
Sample: 1980 2008
Included observations: 29
Cross-sections included: 14
Total pool (unbalanced) observations: 403
Wallace and Hussain estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.300646	0.16981	1.770487	0.0774
T?	-0.018918	0.004948	-3.823405	0.0002
Y80D?	1.031218	0.084938	12.14084	0.0000
EDUD?	-0.023256	0.006267	-3.710647	0.0002
INVD?	0.00342	0.001908	1.792523	0.0738
Random Effects (Cross)				
_AUS--C	-0.026819			
_BLX--C	0.091692			
_DEN--C	0.004174			
_FIN--C	-0.020414			
_FRA--C	-0.04335			
_GER--C	-0.006652			
_GRE--C	-0.214008			
_IRE--C	0.223577			
_ITA--C	-0.017211			
_NET--C	-0.021675			
_POR--C	0.017727			
_SPA--C	0.001457			
_SWE--C	-0.021525			
_UNK--C	0.033029			
Effects Specification				
	S.D.	Rho		
Cross-section random	0.09912	0.5333		
Idiosyncratic random	0.092718	0.4667		

Weighted Statistics

R-squared	0.274688	Mean dependent var	0.281818
Adjusted R-squared	0.267398	S.D. dependent var	0.109814
S.E. of regression	0.093372	Sum squared resid	3.469879
F-statistic	37.68227	Durbin-Watson stat	0.239998
Prob(F-statistic)	0.0000		

Unweighted Statistics

R-squared	0.849835	Mean dependent var	1.639528
Sum squared resid	6.728132	Durbin-Watson stat	0.123773

Table B.1.10. Redundant Fixed Effects Test For Model II

Redundant Fixed Effects Tests
Test cross-section fixed effects

Effects Test		Statistic	d.f.	Prob.
Cross-section F		204.2596	-13386.0000	0.0000
Cross-section Chi-square		831.8837	13.0000	0.0000

Cross-section fixed effects test equation:
Dependent Variable: YD?
Method: Panel Least Squares
Sample: 1980 2008
Included observations: 29
Cross-sections included: 14
Total pool (unbalanced) observations: 403

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.410273	0.198367	-2.068255	0.0393
T?	0.08369	0.008799	9.511121	0.0000
INVD?	-0.013422	0.005018	-2.67507	0.0078
EDUD?	0.149543	0.009856	15.17272	0.0000

R-squared	0.407286	Mean dependent var	1.639528
Adjusted R-squared	0.402829	S.D. dependent var	0.333849
S.E. of regression	0.257988	Akaike info criterion	0.138069
Sum squared resid	26.55658	Schwarz criterion	0.177761
Log likelihood	-23.82096	Hannan-Quinn criter.	0.153783
F-statistic	91.39148	Durbin-Watson stat	0.125104
Prob(F-statistic)	0.0000		

Table B.1.11 Estimation of Model IV

Dependent Variable: YD?
Method: Pooled EGLS (Cross-section weights)
Sample: 1980 2008
Included observations: 29
Cross-sections included: 14
Total pool (unbalanced) observations: 403
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.336606	0.08421	27.74747	0.0000
T?	-0.032527	0.003739	-8.698883	0.0000
INVD?	0.002375	0.001365	1.73975	0.0827
EDUD?	-0.015681	0.004548	-3.447979	0.0006
Fixed Effects (Cross)				
_AUS--C	0.132484			
_BLX--C	0.409109			
_DEN--C	0.35527			
_FIN--C	0.096289			
_FRA--C	0.137017			
_GER--C	0.175004			

Table B.1.11 Contôd

_GRE--C	-0.567376		
_IRE--C	-0.104486		
_ITA--C	-0.030649		
_NET--C	0.138557		
_POR--C	-0.79214		
_SPA--C	-0.428129		
_SWE--C	0.327023		
_UNK--C	0.194345		
Effects Specification			
Cross-section fixed (dummy variables)			
Weighted Statistics			
R-squared	0.957397	Mean dependent var	2.120501
Adjusted R-squared	0.955631	S.D. dependent var	0.75901
S.E. of regression	0.089306	Sum squared resid	3.078558
F-statistic	542.1493	Durbin-Watson stat	0.410094
Prob(F-statistic)	0.0000		
Unweighted Statistics			
R-squared	0.920678	Mean dependent var	1.639528
Sum squared resid	3.554024	Durbin-Watson stat	0.216944

Table B.1.12 Estimation of Model I (Cross-section SUR)

Dependent Variable: YD?
Method: Pooled EGLS (Cross-section SUR)
Sample: 1980 2008
Included observations: 29
Cross-sections included: 14
Total pool (unbalanced) observations: 403
Linear estimation after one-step weighting matrix

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	0.259704	0.021646	11.99762	0.0000
T?	-0.016375	0.001033	-15.85134	0.0000
Y80D?	0.999871	0.005539	180.519	0.0000
INVD?	0.00494	0.000262	18.88546	0.0000
EDUD?	-0.006305	0.000865	-7.289846	0.0000

Weighted Statistics			
R-squared	0.9948	Mean dependent var	-2.540215
Adjusted R-squared	0.994748	S.D. dependent var	25.07815
S.E. of regression	0.953433	Sum squared resid	361.7956
F-statistic	19035.19	Durbin-Watson stat	0.963351
Prob(F-statistic)	0.0000		
Unweighted Statistics			
R-squared	0.853447	Mean dependent var	1.639528
Sum squared resid	6.566321	Durbin-Watson stat	0.130424

Table B.1.13 Estimation of Model V

Dependent Variable: YD?
Method: Pooled Least Squares
Sample (adjusted): 1981 2008
Included observations: 28 after adjustments
Cross-sections included: 14
Total pool (unbalanced) observations: 388
Convergence achieved after 9 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.240343	0.228031	14.21013	0.0000
T?	-0.075673	0.009977	-7.584733	0.0000
INVD?	-0.000918	0.000905	-1.013923	0.3113
EDUD?	-0.004406	0.005539	-0.795519	0.4268
AR(1)	0.934867	0.018122	51.58808	0.0000
Fixed Effects (Cross)				
_AUS--C	0.055596			
_BLX--C	0.425746			
_DEN--C	0.285925			
_FIN--C	0.047574			
_FRA--C	0.091641			
_GER--C	0.210489			
_GRE--C	-0.612264			
_IRE--C	0.190286			
_ITA--C	-0.050926			
_NET--C	0.109175			
_POR--C	-0.844523			
_SPA--C	-0.34387			
_SWE--C	0.23983			
_UNK--C	0.256142			

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.985307	Mean dependent var	1.635036
Adjusted R-squared	0.984632	S.D. dependent var	0.332934
S.E. of regression	0.041273	Akaike info criterion	-3.491932
Sum squared resid	0.630283	Schwarz criterion	-3.308174
Log likelihood	695.4348	Hannan-Quinn criter.	-3.419075
F-statistic	1459.54	Durbin-Watson stat	1.939885
Prob(F-statistic)	0.0000		

Table B.1.14 Estimation of Model V (Cross-section Specific AR Terms)

Dependent Variable: YD?
Method: Pooled Least Squares
Sample (adjusted): 1981 2008
Included observations: 28 after adjustments
Cross-sections included: 14
Total pool (unbalanced) observations: 388
Convergence achieved after 15 iterations

Table B.1.14 Contôd

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.049412	0.167857	18.1667	0.0000
T?	-0.06616	0.00771	-8.580905	0.0000
INVD?	-0.000837	0.000948	-0.882779	0.3779
EDUD?	-0.006494	0.00534	-1.216082	0.2248
_AUS--AR(1)	0.608635	0.175613	3.465778	0.0006
_BLX--AR(1)	0.873946	0.075442	11.58438	0.0000
_DEN--AR(1)	0.704904	0.150133	4.695191	0.0000
_FIN--AR(1)	0.846165	0.098856	8.559545	0.0000
_FRA--AR(1)	0.688721	0.177697	3.87582	0.0001
_GER--AR(1)	0.702315	0.174173	4.032285	0.0001
_GRE--AR(1)	0.83389	0.088196	9.454971	0.0000
_IRE--AR(1)	0.983516	0.02369	41.51676	0.0000
_ITA--AR(1)	0.861043	0.163998	5.250333	0.0000
_NET--AR(1)	0.75665	0.143205	5.283675	0.0000
_POR--AR(1)	0.903964	0.067217	13.44841	0.0000
_SPA--AR(1)	0.909278	0.075183	12.09416	0.0000
_SWE--AR(1)	0.73927	0.15043	4.914393	0.0000
_UNK--AR(1)	0.835673	0.125432	6.66237	0.0000
Fixed Effects (Cross)				
_AUSð C	0.078535			
_BLXð C	0.390994			
_DENð C	0.261759			
_FINð C	0.02223			
_FRAð C	0.122086			
_GERð C	0.209125			
_GREð C	-0.618394			
_IREð C	1.34353			
_ITAð C	-0.045148			
_NETð C	0.105368			
_PORð C	-0.855228			
_SPAð C	-0.390804			
_SWEð C	0.248067			
_UNKð C	0.210042			
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.986089	Mean dependent var		1.635036
Adjusted R-squared	0.98492	S.D. dependent var		0.332934
S.E. of regression	0.040884	Akaike info criterion		-3.479615
Sum squared resid	0.596736	Schwarz criterion		-3.163143
Log likelihood	706.0453	Hannan-Quinn criter.		-3.354139
F-statistic	843.544	Durbin-Watson stat		1.836225
Prob(F-statistic)	0.0000			

Table B.1.15 Estimation of Model II (Cross-section weights and AR Terms)

Dependent Variable: YD?
Method: Pooled EGLS (Cross-section weights)
Sample (adjusted): 1981 2008
Included observations: 28 after adjustments
Cross-sections included: 14
Total pool (unbalanced) observations: 388
Iterate coefficients after one-step weighting matrix
Convergence achieved after 17 total coef iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.505437	0.228837	15.31848	0.0000
T?	-0.088095	0.010118	-8.706874	0.0000
INVD?	-0.001569	0.000893	-1.757607	0.0796
EDUD?	-0.00203	0.005293	-0.383508	0.7016
AR(1)	0.923421	0.019434	47.51619	0.0000
Fixed Effects (Cross)				
_AUS--C	0.05528			
_BLX--C	0.429781			
_DEN--C	0.268385			
_FIN--C	0.026643			
_FRA--C	0.117719			
_GER--C	0.249095			
_GRE--C	-0.609658			
_IRE--C	0.122828			
_ITA--C	-0.015828			
_NET--C	0.120956			
_POR--C	-0.86989			
_SPA--C	-0.341206			
_SWE--C	0.237409			
_UNK--C	0.269882			
Effects Specification				
Cross-section fixed (dummy variables)				
Weighted Statistics				
R-squared	0.983753	Mean dependent var		1.723919
Adjusted R-squared	0.983006	S.D. dependent var		0.508338
S.E. of regression	0.04108	Sum squared resid		0.62441
F-statistic	1317.811	Durbin-Watson stat		1.971451
Prob(F-statistic)	0.0000			
Unweighted Statistics				
R-squared	0.985167	Mean dependent var		1.635036
Sum squared resid	0.636298	Durbin-Watson stat		1.885162

Table B.1.16 Estimation of Model VI

Dependent Variable: YD?
Method: Pooled EGLS (Cross-section weights)
Sample: 1980 1995
Included observations: 16
Cross-sections included: 14
Total pool (balanced) observations: 224
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.567459	0.075447	34.02976	0.0000
T?	-0.044019	0.00371	-11.8647	0.0000
INVD?	-0.00602	0.001092	-5.514063	0.0000
EDUD?	-0.011796	0.003644	-3.237486	0.0014
Fixed Effects (Cross)				
_AUSð C	0.15335			
_BLXð C	0.386524			
_DENð C	0.352564			
_FINð C	0.088457			
_FRAð C	0.187799			
_GERð C	0.236516			
_GREð C	-0.54715			
_IREð C	-0.326872			
_ITAð C	0.027755			
_NETð C	0.148534			
_PORð C	-0.816192			
_SPAð C	-0.453182			
_SWEð C	0.341623			
_UNKð C	0.220273			

Effects Specification

Cross-section fixed (dummy variables)

Weighted Statistics			
R-squared	0.979522	Mean dependent var	2.282081
Adjusted R-squared	0.977939	S.D. dependent var	1.154261
S.E. of regression	0.052627	Sum squared resid	0.573299
F-statistic	618.8373	Durbin-Watson stat	0.88781
Prob(F-statistic)	0.0000		
Unweighted Statistics			
R-squared	0.975073	Mean dependent var	1.649365
Sum squared resid	0.631837	Durbin-Watson stat	0.514471

Table B.1.17 Estimation of Model VII

Dependent Variable: YD?
Method: Pooled EGLS (Cross-section weights)
Sample: 1996 2008
Included observations: 13
Cross-sections included: 14
Total pool (unbalanced) observations: 179
Linear estimation after one-step weighting matrix

Table B.1.17 Contôd

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.896624	0.25854	15.07166	0.0000
T?	-0.10312	0.011205	-9.202893	0.0000
INVD?	0.014633	0.001764	8.297375	0.0000
EDUD?	-0.048531	0.010761	-4.509947	0.0000
Fixed Effects (Cross)				
_AUSð C	0.057757			
_BLXð C	0.45087			
_DENð C	0.356953			
_FINð C	0.052523			
_FRAð C	0.173523			
_GERð C	0.247919			
_GREð C	-0.671665			
_IREð C	0.036107			
_ITAð C	-0.005367			
_NETð C	0.141173			
_PORð C	-0.894661			
_SPAð C	-0.458502			
_SWEð C	0.345329			
_UNKð C	0.272087			
Effects Specification				
Cross-section fixed (dummy variables)				
Weighted Statistics				
R-squared	0.980748	Mean dependent var		1.898145
Adjusted R-squared	0.978847	S.D. dependent var		0.642213
S.E. of regression	0.066854	Sum squared resid		0.724044
F-statistic	515.8069	Durbin-Watson stat		0.452433
Prob(F-statistic)	0.0000			
Unweighted Statistics				
R-squared	0.957028	Mean dependent var		1.627217
Sum squared resid	0.834048	Durbin-Watson stat		0.354682

Table B.1.18 Estimation of Model VIII

Dependent Variable: YD?
Method: Pooled EGLS (Cross-section weights)
Sample: 1980 2008
Included observations: 29
Cross-sections included: 14
Total pool (unbalanced) observations: 403
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.555252	0.11463	22.29136	0.0000
T?	-0.044362	0.005647	-7.85525	0.0000
INVD?	0.002392	0.001362	1.756229	0.0798
EDUD?	-0.01272	0.004672	-2.722653	0.0068
@YEAR>1995	0.034915	0.012691	2.75111	0.0062

Table B.1.18 Contôd

Fixed Effects (Cross)			
_AUSð C	0.128992		
_BLXð C	0.416949		
_DENð C	0.334457		
_FINð C	0.079089		
_FRAð C	0.150806		
_GERð C	0.20442		
_GREð C	-0.568896		
_IREð C	-0.12723		
_ITAð C	-0.010433		
_NETð C	0.144309		
_PORð C	-0.812472		
_SPAð C	-0.420958		
_SWEð C	0.31544		
_UNKð C	0.208661		
Effects Specification			
Cross-section fixed (dummy variables)			
Weighted Statistics			
R-squared	0.957768	Mean dependent var	2.103556
Adjusted R-squared	0.955904	S.D. dependent var	0.747196
S.E. of regression	0.087997	Sum squared resid	2.981226
F-statistic	513.6127	Durbin-Watson stat	0.426252
Prob(F-statistic)	0.0000		
Unweighted Statistics			
R-squared	0.918911	Mean dependent var	1.639528
Sum squared resid	3.633216	Durbin-Watson stat	0.218285

B.2 Estimation Results for Trade Equation

Table B.2.1 Unit Root Test For óGDPTô

Series: GDPT_AUS, GDPT_BLX, GDPT_DEN, GDPT_FIN, GDPT_FRA, GDPT_GER, GDPT_GRE, GDPT_IRE, GDPT_ITA, GDPT_NET, GDPT_POR, GDPT_SPA, GDPT_SWE, GDPT_UNK
Sample: 1980 2008
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic selection of lags based on SIC: 0
Newey-West bandwidth selection using Bartlett kernel
Pool unit root test on GDPt?

Method	Statistic	Prob.
Null: Unit root (assumes common unit root process)		
Levin, Lin & Chu t*	0.9497	0.8289
Null: Unit root (assumes individual unit root process)		
Im, Pesaran and Shin W-stat	6.34064	1.0000
ADF - Fisher Chi-square	2.32917	1.0000

Table B.2.1 Contôd

PP - Fisher Chi-square	2.35288	1.0000
Pool unit toot test on D(GDPt?)		
Method	Statistic	Prob.
Null: Unit root (assumes common unit root process)		
Levin, Lin & Chu t*	-16.5873	0.0000
Null: Unit root (assumes individual unit root process)		
Im, Pesaran and Shin W-stat	-16.8516	0.0000
ADF - Fisher Chi-square	258.176	0.0000
PP - Fisher Chi-square	258.297	0.0000

Table B.2.2 Cointegration Test For óTô, óGDPTô and óYDô

Pedroni Residual Cointegration Test
Series: T? GDPT? YD?
Sample: 1980 2008
Included observations: 29
Cross-sections included: 14
Null Hypothesis: No cointegration
Trend assumption: No deterministic intercept or trend
Lag selection: fixed at 1
Newey-West bandwidth selection with Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

		Statistic	Prob.	Weighted Sta.	Prob.
Panel v-Statistic		-2.594014	0.0138	-2.745189	0.0092
Panel rho-Statistic		1.622775	0.1069	1.520953	0.1255
Panel PP-Statistic		1.048875	0.2302	0.965715	0.2503
Panel ADF-Statistic		1.131268	0.2104	0.569916	0.3391

Alternative hypothesis: individual AR coefs. (between-dimension)

		Statistic	Prob.
Group rho-Statistic		3.325741	0.0016
Group PP-Statistic		2.329219	0.0265
Group ADF-Statistic		2.039955	0.0498

Cross section specific results
Phillips-Peron results (non-parametric)

Cross ID	AR(1)	Variance	HAC	Bandwidth	Obs
_AUS	0.7	0.045518	0.043086	2	28
_BLX	0.943	0.084239	0.093386	1	24
_DEN	0.654	0.146072	0.146072	0	28
_FIN	0.909	0.137144	0.158864	5	28
_FRA	0.753	0.072487	0.083404	1	28
_GER	0.785	0.046732	0.048702	2	28
_GRE	0.966	0.104844	0.080603	2	28

Table B.2.2 Contôd

Cross ID	AR(1)	Variance	HAC	Bandwidth	Obs
_IRE	0.776	0.196192	0.228022	3	28
_ITA	0.804	0.048365	0.048365	0	28
_NET	0.857	0.067604	0.066754	1	28
_POR	0.984	0.0745	0.070172	2	28
_SPA	0.956	0.079987	0.092914	2	28
_SWE	0.793	0.087562	0.085427	3	28
_UNK	0.859	0.080676	0.081969	1	28
Augmented Dickey-Fuller results (parametric)					
Cross ID	AR(1)	Variance	Lag	Max lag	Obs
_AUS	0.738	0.044224	1	--	27
_BLX	0.962	0.083295	1	--	22
_DEN	0.663	0.150704	1	--	27
_FIN	0.865	0.125312	1	--	27
_FRA	0.704	0.072161	1	--	27
_GER	0.756	0.047255	1	--	27
_GRE	1.027	0.094647	1	--	27
_IRE	0.811	0.197757	1	--	27
_ITA	0.761	0.048099	1	--	27
_NET	0.853	0.0663	1	--	27
_POR	0.985	0.072685	1	--	27
_SPA	0.949	0.080484	1	--	27
_SWE	0.761	0.088688	1	--	27
_UNK	0.849	0.08312	1	--	27

Table B.2.3 Estimation of Model IX

Dependent Variable: T?
Method: Pooled Least Squares
Sample: 1980 2008
Included observations: 29
Cross-sections included: 14
Total pool (unbalanced) observations: 403

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-44.20716	1.376803	-32.10856	0.0000
YD?	0.097836	0.093709	1.044044	0.2971
GDPT?	1.314852	0.024345	54.00891	0.0000
D?	-0.634752	0.082354	-7.707646	0.0000
@INGRP(TRPOP)	0.137252	0.068944	1.990771	0.0472

R-squared	0.885692	Mean dependent var	20.43044
Adjusted R-squared	0.884544	S.D. dependent var	1.700914
S.E. of regression	0.577952	Akaike info criterion	1.753676
Sum squared resid	132.9432	Schwarz criterion	1.803291
Log likelihood	-348.3657	Hannan-Quinn criter.	1.773318
F-statistic	770.9582	Durbin-Watson stat	0.120556
Prob(F-statistic)	0.0000		

Table B.2.4 Estimation of Model X

Dependent Variable: T?				
Method: Pooled Least Squares				
Sample: 1980 2008				
Included observations: 29				
Cross-sections included: 14				
Total pool (unbalanced) observations: 403				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-83.0213	1.196063	-69.41215	0.0000
YD?	0.047832	0.134557	0.355482	0.7224
GDPT?	1.971251	0.021969	89.72762	0.0000
Fixed Effects (Cross)				
_AUS--C	0.841901			
_BLX--C	0.935217			
_DEN--C	0.199897			
_FIN--C	0.768451			
_FRA--C	-1.551562			
_GER--C	-1.142282			
_GRE--C	1.241515			
_IRE--C	1.100597			
_ITA--C	-0.866275			
_NET--C	0.381789			
_POR--C	0.475263			
_SPA--C	-0.764844			
_SWE--C	0.15199			
_UNK--C	-1.674912			
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.978786	Mean dependent var		20.43044
Adjusted R-squared	0.977964	S.D. dependent var		1.700914
S.E. of regression	0.252492	Akaike info criterion		0.124018
Sum squared resid	24.67211	Schwarz criterion		0.282785
Log likelihood	-8.989725	Hannan-Quinn criter.		0.186874
F-statistic	1190.398	Durbin-Watson stat		0.587242
Prob(F-statistic)	0.0000			

Table B.2.5 Estimation of Model XI

Dependent Variable: T?
Method: Pooled EGLS (Cross-section random effects)
Sample: 1980 2008
Included observations: 29
Cross-sections included: 14
Total pool (unbalanced) observations: 403
Swamy and Arora estimator of component variances

Table B.2.5 Contôd

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-75.45199	2.207679	-34.17707	0.0000
YD?	-0.018561	0.123549	-0.150234	0.8807
GDPT?	1.922771	0.021293	90.30223	0.0000
D?	-0.691941	0.267237	-2.589241	0.0100
@INGRP(TRPOP)	0.033271	0.212565	0.156521	0.8757
Random Effects (Cross)				
_AUS--C	0.54155			
_BLX--C	0.977313			
_DEN--C	0.162577			
_FIN--C	0.728132			
_FRA--C	-1.356184			
_GER--C	-1.135524			
_GRE--C	0.455549			
_IRE--C	1.261099			
_ITA--C	-0.985558			
_NET--C	0.431397			
_POR--C	0.678391			
_SPA--C	-0.540454			
_SWE--C	0.193651			
_UNK--C	-1.41194			
Effects Specification				
	S.D.	Rho		
Cross-section random	0.347749	0.6548		
Idiosyncratic random	0.252492	0.3452		
Weighted Statistics				
R-squared	0.944609	Mean dependent var		2.739754
Adjusted R-squared	0.944052	S.D. dependent var		1.175448
S.E. of regression	0.277808	Sum squared resid		30.71647
F-statistic	1696.815	Durbin-Watson stat		0.470089
Prob(F-statistic)	0.0000			
Unweighted Statistics				
R-squared	0.705101	Mean dependent var		20.43044
Sum squared resid	342.9763	Durbin-Watson stat		0.0421

Table B.2.6 Redundant Fixed Effects Test for Model X

Redundant Fixed Effects Tests Test cross-section fixed effects				
Effects Test		**Statistic**	**d.f.**	**Prob.**
Cross-section F		159.485249	-13,387	0.0000
Cross-section Chi-squ.		745.395742	13.0000	0.0000
Cross-section fixed effects test equation: Dependent Variable: T? Method: Panel Least Squares Sample: 1980 2008 Included observations: 29				

Table B.2.6 Contôd

Cross-sections included: 14 Total pool (unbalanced) observations: 403				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-48.62807	1.367089	-35.57051	0.0000
YD?	0.113674	0.094756	1.199651	0.2310
GDPT?	1.313339	0.026369	49.80633	0.0000

R-squared	0.865137	Mean dependent var	20.43044
Adjusted R-squared	0.864462	S.D. dependent var	1.700914
S.E. of regression	0.626199	Akaike info criterion	1.90912
Sum squared resid	156.8501	Schwarz criterion	1.938888
Log likelihood	-381.6876	Hannan-Quinn criter.	1.920905
F-statistic	1282.982	Durbin-Watson stat	0.102432
Prob(F-statistic)	0.0000		

Table B.2.7 Estimation of Model XI (Wallace and Hussain Approach)

Dependent Variable: T? Method: Pooled EGLS (Cross-section random effects) Sample: 1980 2008 Included observations: 29 Cross-sections included: 14 Total pool (unbalanced) observations: 403 Wallace and Hussain estimator of component variances				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-73.05588	3.079409	-23.724	0.0000
YD?	-0.059942	0.206639	-0.29008	0.7719
GDPT?	1.876849	0.037325	50.28438	0.0000
D?	-0.681558	0.335406	-2.032037	0.0428
@INGRP(TRPOP)	0.053933	0.268956	0.200527	0.8412
Random Effects (Cross)				
_AUS--C	0.50137			
_BLX--C	0.963038			
_DEN--C	0.127177			
_FIN--C	0.679703			
_FRA--C	-1.259698			
_GER--C	-1.044725			
_GRE--C	0.401196			
_IRE--C	1.170837			
_ITA--C	-0.906477			
_NET--C	0.416178			
_POR--C	0.586679			
_SPA--C	-0.520312			
_SWE--C	0.194609			
_UNK--C	-1.309574			

Table B.2.7 Contôd

Effects Specification			
	S.D.	Rho	
Cross-section random	0.431615	0.472	
Idiosyncratic random	0.456461	0.528	
Weighted Statistics			
R-squared	0.935422	Mean dependent var	3.950926
Adjusted R-squared	0.934773	S.D. dependent var	1.188974
S.E. of regression	0.303176	Sum squared resid	36.58245
F-statistic	1441.282	Durbin-Watson stat	0.394367
Prob(F-statistic)	0.0000		
Unweighted Statistics			
R-squared	0.731919	Mean dependent var	20.43044
Sum squared resid	311.7864	Durbin-Watson stat	0.046272

Table B.2.8 Estimation of Model XII

Dependent Variable: T?
Method: Pooled EGLS (Cross-section weights)
Sample: 1980 2008
Included observations: 29
Cross-sections included: 14
Total pool (unbalanced) observations: 403
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-79.25197	1.12504	-70.44371	0.0000
YD?	-0.363727	0.125124	-2.906934	0.0039
GDPT?	1.91224	0.019491	98.11041	0.0000
Fixed Effects (Cross)				
_AUS--C	0.865823			
_BLX--C	1.08367			
_DEN--C	0.305652			
_FIN--C	0.759053			
_FRA--C	-1.430594			
_GER--C	-0.994261			
_GRE--C	0.974184			
_IRE--C	0.993651			
_ITA--C	-0.823827			
_NET--C	0.433468			
_POR--C	0.111973			
_SPA--C	-0.903011			
_SWE--C	0.26026			
_UNK--C	-1.523938			
Effects Specification				
Cross-section fixed (dummy variables)				
Weighted Statistics				
R-squared	0.985126	Mean dependent var	24.87619	
Adjusted R-squared	0.984549	S.D. dependent var	10.81703	

Table B.2.8 Contôd

S.E. of regression	0.248031	Sum squared resid	23.808
F-statistic	1708.727	Durbin-Watson stat	0.690734
Prob(F-statistic)	0.0000		
Unweighted Statistics			
R-squared	0.977965	Mean dependent var	20.43044
Sum squared resid	25.62724	Durbin-Watson stat	0.552408

Table B.2.9 Estimation of Model IX (Cross-section SUR)

Dependent Variable: T?
Method: Pooled EGLS (Cross-section SUR)
Sample: 1980 2008
Included observations: 29
Cross-sections included: 14
Total pool (unbalanced) observations: 403
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-43.82471	0.454848	-96.3503	0.0000
YD?	0.076003	0.028904	2.629515	0.0089
GDPT?	1.307219	0.008699	150.2804	0.0000
D?	-0.626385	0.022354	-28.02101	0.0000
@INGRP(TRPOP)	0.138556	0.009835	14.08807	0.0000

Weighted Statistics			
R-squared	0.990996	Mean dependent var	23.4294
Adjusted R-squared	0.990905	S.D. dependent var	59.95741
S.E. of regression	0.980022	Sum squared resid	382.256
F-statistic	10950.73	Durbin-Watson stat	1.427332
Prob(F-statistic)	0.0000		
Unweighted Statistics			
R-squared	0.885624	Mean dependent var	20.43044
Sum squared resid	133.0227	Durbin-Watson stat	0.120371

Table B.2.10 Estimation of Model XIII

Dependent Variable: T?
Method: Pooled Least Squares
Sample (adjusted): 1981 2008
Included observations: 28 after adjustments
Cross-sections included: 14
Total pool (unbalanced) observations: 388
Convergence achieved after 8 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-81.27469	2.780196	-29.23343	0.0000
YD?	-0.460049	0.192117	-2.394634	0.0171
GDPT?	1.953604	0.051476	37.95178	0.0000
AR(1)	0.695897	0.035308	19.7094	0.0000

Table B.2.10 Contôd

Fixed Effects (Cross)			
_AUS--C	0.796716		
_BLX--C	1.138891		
_DEN--C	0.506234		
_FIN--C	0.785136		
_FRA--C	-1.503211		
_GER--C	-1.091763		
_GRE--C	0.99504		
_IRE--C	1.150086		
_ITA--C	-0.856642		
_NET--C	0.38324		
_POR--C	0.069985		
_SPA--C	-0.927689		
_SWE--C	0.305678		
_UNK--C	-1.589003		
Effects Specification			
Cross-section fixed (dummy variables)			
R-squared	0.989668	Mean dependent var	20.49486
Adjusted R-squared	0.989222	S.D. dependent var	1.671827
S.E. of regression	0.173564	Akaike info criterion	-0.621715
Sum squared resid	11.17617	Schwarz criterion	-0.448166
Log likelihood	137.6128	Hannan-Quinn criter.	-0.552906
F-statistic	2220.977	Durbin-Watson stat	2.182351
Prob(F-statistic)	0.0000		

Table B.2.11 Estimation of Model XIII (Cross-section Specific AR Terms)

Dependent Variable: T?
Method: Pooled Least Squares
Sample (adjusted): 1981 2008
Included observations: 28 after adjustments
Cross-sections included: 14
Total pool (unbalanced) observations: 388
Convergence achieved after 18 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-89.93134	2.256198	-39.85969	0.0000
YD?	-0.423422	0.182893	-2.315139	0.0212
GDPT?	2.11652	0.041258	51.29924	0.0000
_AUS--AR(1)	0.920184	0.071447	12.8793	0.0000
_BLX--AR(1)	0.909353	0.14309	6.355132	0.0000
_DEN--AR(1)	0.410123	0.143912	2.849826	0.0046
_FIN--AR(1)	0.261041	0.15045	1.735067	0.0836
_FRA--AR(1)	0.494802	0.183092	2.702481	0.0072
_GER--AR(1)	0.963032	0.126663	7.603107	0.0000
_GRE--AR(1)	0.194184	0.173621	1.118437	0.2641
_IRE--AR(1)	0.702159	0.096394	7.284232	0.0000
_ITA--AR(1)	0.822899	0.240494	3.421704	0.0007

Table B.2.11 Contôd

Variable	Coefficient	Std. Error	t-Statistic	Prob.
_NET--AR(1)	0.978746	0.108469	9.023296	0.0000
_POR--AR(1)	0.618328	0.095204	6.494791	0.0000
_SPA--AR(1)	0.570918	0.133481	4.277136	0.0000
_SWE--AR(1)	0.628499	0.136845	4.592768	0.0000
_UNK--AR(1)	0.875171	0.152322	5.745532	0.0000
Fixed Effects (Cross)				
_AUS--C	0.435619			
_BLX--C	1.062912			
_DEN--C	0.587653			
_FIN--C	1.012784			
_FRA--C	-1.681528			
_GER--C	-2.016269			
_GRE--C	1.194762			
_IRE--C	1.404499			
_ITA--C	-1.039219			
_NET--C	-1.196856			
_POR--C	0.318608			
_SPA--C	-0.974437			
_SWE--C	0.374194			
_UNK--C	-1.921121			
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.990669	Mean dependent var		20.49486
Adjusted R-squared	0.989913	S.D. dependent var		1.671827
S.E. of regression	0.167909	Akaike info criterion		-0.65662
Sum squared resid	10.09327	Schwarz criterion		-0.350357
Log likelihood	157.3843	Hannan-Quinn criter.		-0.535191
F-statistic	1310.616	Durbin-Watson stat		2.075191
Prob(F-statistic)	0.0000			

Table B.2.12 Estimation of Model X (Cross-section weights and AR term)

Dependent Variable: T?
Method: Pooled EGLS (Cross-section weights)
Sample (adjusted): 1981 2008
Included observations: 28 after adjustments
Cross-sections included: 14
Total pool (unbalanced) observations: 388
Iterate coefficients after one-step weighting matrix
Convergence achieved after 15 total coef iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-72.46074	2.600134	-27.86808	0.0000
YD?	-0.73033	0.162532	-4.493453	0.0000
GDPT?	1.794485	0.047347	37.90089	0.0000
AR(1)	0.720359	0.034131	21.10597	0.0000

Table B.2.12 Contôd

Fixed Effects (Cross)			
_AUS--C	0.733514		
_BLX--C	1.194612		
_DEN--C	0.496772		
_FIN--C	0.656545		
_FRA--C	-1.264063		
_GER--C	-0.793343		
_GRE--C	0.706215		
_IRE--C	0.938073		
_ITA--C	-0.687565		
_NET--C	0.420751		
_POR--C	-0.30696		
_SPA--C	-0.948078		
_SWE--C	0.338828		
_UNK--C	-1.314643		
Effects Specification			
Cross-section fixed (dummy variables)			
Weighted Statistics			
R-squared	0.992529	Mean dependent var	25.26776
Adjusted R-squared	0.992206	S.D. dependent var	11.22808
S.E. of regression	0.170519	Sum squared resid	10.78752
F-statistic	3080.351	Durbin-Watson stat	2.073926
Prob(F-statistic)	0.0000		
Unweighted Statistics			
R-squared	0.98942	Mean dependent var	20.49486
Sum squared resid	11.44387	Durbin-Watson stat	2.180927

Table B.2.13 Estimation of Model XIV

Dependent Variable: T?
Method: Pooled EGLS (Cross-section weights)
Sample: 1980 1995
Included observations: 16
Cross-sections included: 14
Total pool (balanced) observations: 224
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-77.42701	1.699743	-45.55218	0.0000
YD?	-0.388302	0.192925	-2.012708	0.0454
GDPT?	1.877582	0.028692	65.43864	0.0000
Fixed Effects (Cross)				
_AUS--C	1.105503			
_BLX--C	1.178602			
_DEN--C	0.156001			
_FIN--C	0.60584			
_FRA--C	-1.388616			
_GER--C	-0.793125			

Table B.2.13 Contôd

_GRE--C	0.876482		
_IRE--C	0.721212		
_ITA--C	-0.758877		
_NET--C	0.606869		
_POR--C	-0.095752		
_SPA--C	-1.027671		
_SWE--C	0.211516		
_UNK--C	-1.397986		
Effects Specification			
Cross-section fixed (dummy variables)			
Weighted Statistics			
R-squared	0.991073	Mean dependent var	34.33666
Adjusted R-squared	0.990429	S.D. dependent var	27.2906
S.E. of regression	0.240427	Sum squared resid	12.02343
F-statistic	1539.496	Durbin-Watson stat	1.250528
Prob(F-statistic)	0.0000		
Unweighted Statistics			
R-squared	0.97672	Mean dependent var	19.57338
Sum squared resid	12.34705	Durbin-Watson stat	0.876935

Table B.2.14 Estimation of Model XV

Dependent Variable: T?
Method: Pooled EGLS (Cross-section weights)
Sample: 1996 2008
Included observations: 13
Cross-sections included: 14
Total pool (unbalanced) observations: 179
Linear estimation after one-step weighting matrix

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-73.83104	2.074512	-35.5896	0.0000
YD?	-0.694306	0.126107	-5.505681	0.0000
GDPT?	1.820507	0.037848	48.10078	0.0000
Fixed Effects (Cross)				
_AUS--C	0.537409			
_BLX--C	1.065534			
_DEN--C	0.50926			
_FIN--C	0.851817			
_FRA--C	-1.280115			
_GER--C	-0.984236			
_GRE--C	0.771018			
_IRE--C	1.198469			
_ITA--C	-0.786756			
_NET--C	0.271466			
_POR--C	-0.039473			
_SPA--C	-0.820435			
_SWE--C	0.377924			
_UNK--C	-1.425991			

Table B.2.14 Contôd

Effects Specification			
Cross-section fixed (dummy variables)			
Weighted Statistics			
R-squared	0.988181	Mean dependent var	25.71241
Adjusted R-squared	0.987093	S.D. dependent var	9.319547
S.E. of regression	0.15712	Sum squared resid	4.023943
F-statistic	908.5593	Durbin-Watson stat	0.916923
Prob(F-statistic)	0.0000		
Unweighted Statistics			
R-squared	0.984644	Mean dependent var	21.50297
Sum squared resid	4.026521	Durbin-Watson stat	0.840191

Table B.2.15 Estimation of Model XVI

Dependent Variable: T?
Method: Pooled EGLS (Cross-section weights)
Sample: 1980 2008
Included observations: 29
Cross-sections included: 14
Total pool (unbalanced) observations: 403
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-78.53025	1.864779	-42.11237	0.0000
YD?	-0.368568	0.125981	-2.925589	0.0036
GDPT?	1.898468	0.034455	55.10016	0.0000
@YEAR>1995	0.018907	0.036369	0.519866	0.6035
Fixed Effects (Cross)				
_AUS--C	0.858795			
_BLX--C	1.082317			
_DEN--C	0.297219			
_FIN--C	0.745656			
_FRA--C	-1.411014			
_GER--C	-0.969786			
_GRE--C	0.95891			
_IRE--C	0.972862			
_ITA--C	-0.807445			
_NET--C	0.435159			
_POR--C	0.092517			
_SPA--C	-0.897862			
_SWE--C	0.257712			
_UNK--C	-1.503077			

Effects Specification			
Cross-section fixed (dummy variables)			
Weighted Statistics			
R-squared	0.985068	Mean dependent var	24.82323
Adjusted R-squared	0.984449	S.D. dependent var	10.64016
S.E. of regression	0.248213	Sum squared resid	23.78137

Table B.2.15 Contôd

F-statistic	1591.509	Durbin-Watson stat	0.69576
Prob(F-statistic)	0.0000		
Unweighted Statistics			
R-squared	0.97797	Mean dependent var	20.43044
Sum squared resid	25.62187	Durbin-Watson stat	0.553299

B.3 Simultaneous Equation

B.3.1 Estimation Results of Income Dispersion Equation

Table B.3.1.1 Hausman Simultaneity Test for Income Dispersion Equation (Step 1)

Dependent Variable: T?
Method: Pooled Least Squares
Sample: 1980 2008
Included observations: 29
Cross-sections included: 14
Total pool (unbalanced) observations: 403

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-39.12027	1.436691	-27.22942	0.0000
GDPT?	1.167572	0.029789	39.19504	0.0000
D?	-0.321809	0.086238	-3.73163	0.0002
Y80D?	0.715849	0.12244	5.84652	0.0000
EDUD?	-0.226154	0.028315	-7.987151	0.0000
INVD?	-0.012917	0.010844	-1.191181	0.2343

R-squared	0.900222	Mean dependent var	20.43044
Adjusted R-squared	0.898966	S.D. dependent var	1.700914
S.E. of regression	0.540651	Akaike info criterion	1.622691
Sum squared resid	116.0445	Schwarz criterion	1.682229
Log likelihood	-320.9723	Hannan-Quinn criter.	1.646262
F-statistic	716.3683	Durbin-Watson stat	0.187632
Prob(F-statistic)	0.0000		

Table B.3.1.2 Hausman Simultaneity Test for Income Dispersion Equation (Step 2)

Dependent Variable: YD?
Method: Pooled Least Squares
Sample: 1980 2008
Included observations: 29
Cross-sections included: 14
Total pool (unbalanced) observations: 403

Table B.3.1.2 Contôd

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.41583	0.109533	3.796388	0.0002
T?	-0.025567	0.005823	-4.390788	0.0000
Y80D?	1.024368	0.029574	34.63718	0.0000
EDUD?	-0.013822	0.006945	-1.99019	0.0473
INVD?	0.005783	0.00254	2.276818	0.0233
R1?	0.035735	0.013165	2.714433	0.0069
R-squared	0.856656	Mean dependent var		1.639528
Adjusted R-squared	0.854851	S.D. dependent var		0.333849
S.E. of regression	0.127191	Akaike info criterion		-1.271471
Sum squared resid	6.422529	Schwarz criterion		-1.211933
Log likelihood	262.2014	Hannan-Quinn criter.		-1.2479
F-statistic	474.5127	Durbin-Watson stat		0.145494
Prob(F-statistic)	0.0000			

Table B.3.1.3 Hausman Simultaneity Test for Trade Equation (Step 1)

Dependent Variable: YD?
Method: Pooled Least Squares
Sample: 1980 2008
Included observations: 29
Cross-sections included: 14
Total pool (balanced) observations: 406

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.78827	0.282547	2.789873	0.0055
Y80D?	1.117048	0.023422	47.69238	0.0000
EDUD?	-0.039625	0.005389	-7.35359	0.0000
INVD?	0.002983	0.002133	1.398741	0.1627
D?	0.231239	0.016891	13.68995	0.0000
GDPT?	-0.050014	0.005805	-8.616076	0.0000
R-squared	0.899925	Mean dependent var		1.643495
Adjusted R-squared	0.898674	S.D. dependent var		0.3358
S.E. of regression	0.106891	Akaike info criterion		-1.619349
Sum squared resid	4.570261	Schwarz criterion		-1.560142
Log likelihood	334.7279	Hannan-Quinn criter.		-1.595916
F-statistic	719.4005	Durbin-Watson stat		0.193112
Prob(F-statistic)	0.0000			

Table B.3.1.4 Hausman Simultaneity Test for Trade Equation (Step 2)

Dependent Variable: T?
Method: Pooled Least Squares
Sample: 1980 2008
Included observations: 29
Cross-sections included: 14
Total pool (unbalanced) observations: 403

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-44.12105	1.383178	-31.89832	0.0000
YD?	0.157761	0.092781	1.700364	0.0898
D?	-0.664886	0.081334	-8.174793	0.0000
GDPT?	1.316177	0.024493	53.73783	0.0000
R2?	0.058969	0.287182	0.205336	0.8374

R-squared	0.884566	Mean dependent var	20.43044
Adjusted R-squared	0.883406	S.D. dependent var	1.700914
S.E. of regression	0.580791	Akaike info criterion	1.763479
Sum squared resid	134.2528	Schwarz criterion	1.813093
Log likelihood	-350.3409	Hannan-Quinn criter.	1.783121
F-statistic	762.4672	Durbin-Watson stat	0.121075
Prob(F-statistic)	0.0000		

Table B.3.1.5 Estimation Results of Model XVII

Dependent Variable: YD?
Method: Pooled IV/Two-stage Least Squares
Sample: 1980 2008
Included observations: 29
Cross-sections included: 14
Total pool (unbalanced) observations: 403
Instrument list: C POPT? D? INVD? EDUD? Y80D?

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.416474	0.137178	3.036018	0.0026
T?	-0.025604	0.007487	-3.419872	0.0007
EDUD?	-0.013852	0.007997	-1.732256	0.084
INVD?	0.005781	0.00258	2.240754	0.0256
Y80D?	1.02448	0.033028	31.0182	0.0000

R-squared	0.853342	Mean dependent var	1.639528
Adjusted R-squared	0.851868	S.D. dependent var	0.333849
S.E. of regression	0.128492	Sum squared resid	6.571025
F-statistic	580.7811	Durbin-Watson stat	0.131129
Prob(F-statistic)	0.0000	Second-Stage SSR	6.553323
Instrument rank	6.0000		

Table B.3.1.6 Estimation Results of Model XVIII

Dependent Variable: YD?				
Method: Pooled IV/Two-stage Least Squares				
Sample (adjusted): 1981 2008				
Included observations: 28 after adjustments				
Cross-sections included: 14				
Total pool (unbalanced) observations: 388				
Instrument list: C POPT? INVD? EDUD? T?(-1)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	2.041013	0.12474	16.36219	0.0000
T?	-0.017365	0.005487	-3.16497	0.0017
INVD?	0.002886	0.001944	1.484509	0.1385
EDUD?	-0.023211	0.006671	-3.479233	0.0006
Fixed Effects (Cross)				
_AUS--C	0.138118			
_BLX--C	0.398484			
_DEN--C	0.392385			
_FIN--C	0.122755			
_FRA--C	0.119245			
_GER--C	0.134717			
_GRE--C	-0.57719			
_IRE--C	-0.064565			
_ITA--C	-0.059158			
_NET--C	0.131377			
_POR--C	-0.765586			
_SPA--C	-0.440416			
_SWE--C	0.349198			
_UNK--C	0.177561			
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.92591	Mean dependent var		1.635036
Adjusted R-squared	0.922714	S.D. dependent var		0.332934
S.E. of regression	0.092557	Sum squared resid		3.178249
F-statistic	290.7388	Durbin-Watson stat		0.255967
Prob(F-statistic)	0.0000	Second-Stage SSR		3.168495
Instrument rank	18.0000			

Table B.3.1.7 Estimation Results of Model XIX

Dependent Variable: YD?
Method: Pooled IV/Two-stage EGLS (Cross-section random effects)
Sample: 1980 2008
Included observations: 29
Cross-sections included: 14
Total pool (unbalanced) observations: 403
Instrument list: C POPT? INVD? EDUD? D? Y80D?
Swamy and Arora estimator of component variances

Table B.3.1.7 Contôd

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.527954	0.196808	2.682585	0.0076
T?	-0.031919	0.007189	-4.440125	0.0000
EDUD?	-0.033242	0.007478	-4.445117	0.0000
INVD?	0.002874	0.001946	1.47668	0.1406
Y80D?	1.069299	0.08924	11.98224	0.0000
Random Effects (Cross)				
_AUS--C	-0.034158			
_BLX--C	0.078024			
_DEN--C	-0.005087			
_FIN--C	-0.031993			
_FRA--C	-0.033612			
_GER--C	0.009148			
_GRE--C	-0.227801			
_IRE--C	0.215417			
_ITA--C	-0.003999			
_NET--C	-0.018268			
_POR--C	0.019445			
_SPA--C	0.006778			
_SWE--C	-0.017772			
_UNK--C	0.043877			
Effects Specification				
	S.D.	Rho		
Cross-section random	0.102824	0.5447		
Idiosyncratic random	0.094007	0.4553		
Weighted Statistics				
R-squared	0.254914	Mean dependent var		0.275623
Adjusted R-squared	0.247425	S.D. dependent var		0.10918
S.E. of regression	0.094109	Sum squared resid		3.524893
F-statistic	38.26414	Durbin-Watson stat		0.233331
Prob(F-statistic)	0.0000	Second-Stage SSR		3.416853
Instrument rank	6.0000			
Unweighted Statistics				
R-squared	0.847934	Mean dependent var		1.639528
Sum squared resid	6.813338	Durbin-Watson stat		0.120714
Second-Stage SSR	8.004361			

Table B.3.1.8 Estimation Results of Model XX

Dependent Variable: YD?
Method: Pooled IV/Two-stage EGLS (Cross-section weights)
Sample (adjusted): 1981 2008
Included observations: 28 after adjustments
Cross-sections included: 14
Total pool (unbalanced) observations: 388
Linear estimation after one-step weighting matrix
Instrument list: C POPT? INVD? EDUD? T?(-1)

Table B.3.1.8 Contôd

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.275559	0.092327	24.64667	0.0000
T?	-0.029862	0.004099	-7.284812	0.0000
INVD?	0.002206	0.001391	1.585341	0.1137
EDUD?	-0.013915	0.00473	-2.941777	0.0035
Fixed Effects (Cross)				
_AUS--C	0.133104			
_BLX--C	0.407649			
_DEN--C	0.357661			
_FIN--C	0.099032			
_FRA--C	0.132466			
_GER--C	0.170014			
_GRE--C	-0.566837			
_IRE--C	-0.088523			
_ITA--C	-0.03366			
_NET--C	0.135508			
_POR--C	-0.782053			
_SPA--C	-0.423021			
_SWE--C	0.323335			
_UNK--C	0.193559			
Effects Specification				
Cross-section fixed (dummy variables)				
Weighted Statistics				
R-squared	0.958049	Mean dependent var		2.119585
Adjusted R-squared	0.95624	S.D. dependent var		0.758683
S.E. of regression	0.088606	Sum squared resid		2.912742
F-statistic	522.0713	Durbin-Watson stat		0.429285
Prob(F-statistic)	0.0000	Second-Stage SSR		2.952677
Instrument rank	18.0000			
Unweighted Statistics				
R-squared	0.92194	Mean dependent var		1.635036
Sum squared resid	3.348525	Durbin-Watson stat		0.22714
Second-Stage SSR	3.306558			

Table B.3.1.9 Estimation Results of Model XXI

Dependent Variable: YD?
Method: Pooled IV/Two-stage Least Squares
Sample (adjusted): 1981 2008
Included observations: 28 after adjustments
Cross-sections included: 14
Total pool (unbalanced) observations: 388
Instrument list: C POPT? INVD? EDUD? T?(-1)
Lagged dependent variable & regressors added to instrument list
Convergence achieved after 18 iterations

Table B.3.1.9 Contôd

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.134906	0.496645	6.312163	0.0000
T?	-0.071014	0.022108	-3.212112	0.0014
INVD?	-0.000927	0.000908	-1.020925	0.3080
EDUD?	-0.004736	0.005667	-0.835588	0.4039
AR(1)	0.931651	0.020564	45.30449	0.0000
Fixed Effects (Cross)				
_AUS--C	0.062688			
_BLX--C	0.423821			
_DEN--C	0.289795			
_FIN--C	0.05346			
_FRA--C	0.091601			
_GER--C	0.20448			
_GRE--C	-0.60838			
_IRE--C	0.176109			
_ITA--C	-0.053383			
_NET--C	0.109946			
_POR--C	-0.83594			
_SPA--C	-0.349126			
_SWE--C	0.244703			
_UNK--C	0.250771			
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.985299	Mean dependent var		1.635036
Adjusted R-squared	0.984624	S.D. dependent var		0.332934
S.E. of regression	0.041284	Sum squared resid		0.630621
F-statistic	1292.623	Durbin-Watson stat		1.941482
Prob(F-statistic)	0.0000	Second-Stage SSR		0.710323
Instrument rank	21.0000			

Table B.3.1.10 Estimation Results of Model XVII (Cross-section SUR)

Dependent Variable: YD?				
Method: Pooled IV/Two-stage EGLS (Cross-section SUR)				
Sample: 1980 2008				
Included observations: 29				
Cross-sections included: 14				
Total pool (unbalanced) observations: 403				
Linear estimation after one-step weighting matrix				
Instrument list: C POPT? INVD? EDUD? D? Y80D?				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	0.384635	0.029212	13.16698	0.0000
T?	-0.023596	0.00134	-17.61519	0.0000
INVD?	0.004602	0.000265	17.3929	0.0000
EDUD?	-0.011892	0.00098	-12.13004	0.0000
Y80D?	1.020987	0.006045	168.8882	0.0000

Table B.3.1.10 Contôd

Weighted Statistics			
R-squared	0.993735	Mean dependent var	-1.688983
Adjusted R-squared	0.993672	S.D. dependent var	24.26621
S.E. of regression	0.952845	Sum squared resid	361.3498
F-statistic	12564.55	Durbin-Watson stat	0.978864
Prob(F-statistic)	0.0000	Second-Stage SSR	453.1708
Instrument rank	6.0000		
Unweighted Statistics			
R-squared	0.853351	Mean dependent var	1.639528
Sum squared resid	6.570613	Durbin-Watson stat	0.126522
Second-Stage SSR	6.338108		

Table B.3.1.11 Estimation Results of Model XVIII

Dependent Variable: YD?
Method: Pooled IV/Two-stage EGLS (Cross-section weights)
Sample (adjusted): 1981 2008
Included observations: 28 after adjustments
Cross-sections included: 14
Total pool (unbalanced) observations: 388
Iterate coefficients after one-step weighting matrix
Instrument list: C POPT? INVD? EDUD? T?(-1)
Lagged dependent variable & regressors added to instrument list
Convergence achieved after 29 total coef iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.718875	0.361826	7.514312	0.0000
T?	-0.052261	0.016814	-3.108223	0.0020
INVD?	-0.001741	0.000923	-1.887593	0.0599
EDUD?	-0.004101	0.005313	-0.771835	0.4407
AR(1)	0.888307	0.026288	33.7913	0.0000
Fixed Effects (Cross)				
_AUS--C	0.097116			
_BLX--C	0.416217			
_DEN--C	0.303193			
_FIN--C	0.071573			
_FRA--C	0.105954			
_GER--C	0.192264			
_GRE--C	-0.582264			
_IRE--C	0.060784			
_ITA--C	-0.044838			
_NET--C	0.119421			
_POR--C	-0.803264			
_SPA--C	-0.373587			
_SWE--C	0.269044			
_UNK--C	0.227846			
Effects Specification				
Cross-section fixed (dummy variables)				

Table B.3.1.11 Contôd

Weighted Statistics			
R-squared	0.98338	Mean dependent var	1.719405
Adjusted R-squared	0.982616	S.D. dependent var	0.502126
S.E. of regression	0.04164	Sum squared resid	0.64154
F-statistic	1122.27	Durbin-Watson stat	1.974509
Prob(F-statistic)	0.0000	Second-Stage SSR	0.734341
Instrument rank	21.0000		
Unweighted Statistics			
R-squared	0.984983	Mean dependent var	1.635036
Sum squared resid	0.644163	Durbin-Watson stat	1.874327
Second-Stage SSR	0.715812		

Table B.3.1.12 Estimation Results of Model XXII

Dependent Variable: YD?
Method: Pooled IV/Two-stage EGLS (Cross-section weights)
Sample (adjusted): 1981 1995
Included observations: 15 after adjustments
Cross-sections included: 14
Total pool (balanced) observations: 210
Linear estimation after one-step weighting matrix
Instrument list: C POPT? INVD? EDUD? T?(-1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.556142	0.085618	29.85502	0.0000
T?	-0.043479	0.004195	-10.36419	0.0000
INVD?	-0.006609	0.00109	-6.061191	0.0000
EDUD?	-0.011635	0.003606	-3.226808	0.0015
Fixed Effects (Cross)				
_AUS--C	0.151165			
_BLX--C	0.389589			
_DEN--C	0.356273			
_FIN--C	0.089492			
_FRA--C	0.184273			
_GER--C	0.235035			
_GRE--C	-0.554806			
_IRE--C	-0.316468			
_ITA--C	0.028358			
_NET--C	0.14335			
_POR--C	-0.812736			
_SPA--C	-0.45297			
_SWE--C	0.339427			
_UNK--C	0.220018			

Effects Specification			
Cross-section fixed (dummy variables)			
Weighted Statistics			
R-squared	0.979073	Mean dependent var	2.332169
Adjusted R-squared	0.977338	S.D. dependent var	1.184451

Table B.3.1.12 Contôd

S.E. of regression	0.05158	Sum squared resid	0.513486
F-statistic	559.4029	Durbin-Watson stat	0.970004
Prob(F-statistic)	0.0000	Second-Stage SSR	0.517919
Instrument rank	18.0000		
Unweighted Statistics			
R-squared	0.976104	Mean dependent var	1.644448
Sum squared resid	0.568505	Durbin-Watson stat	0.553964
Second-Stage SSR	0.516327		

Table B.3.1.13 Estimation Results of Model XXIII

Dependent Variable: YD?
Method: Pooled IV/Two-stage EGLS (Cross-section weights)
Sample: 1996 2008
Included observations: 13
Cross-sections included: 14
Total pool (unbalanced) observations: 178
Linear estimation after one-step weighting matrix
Instrument list: C POPT? INVD? EDUD? T?(-1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.662727	0.285899	12.81126	0.0000
T?	-0.093154	0.012399	-7.512909	0.0000
INVD?	0.015135	0.001843	8.212653	0.0000
EDUD?	-0.040713	0.011435	-3.560197	0.0005
Fixed Effects (Cross)				
_AUS--C	0.064491			
_BLX--C	0.457046			
_DEN--C	0.3519			
_FIN--C	0.061112			
_FRA--C	0.166142			
_GER--C	0.238018			
_GRE--C	-0.653942			
_IRE--C	0.052007			
_ITA--C	-0.009589			
_NET--C	0.145195			
_POR--C	-0.877201			
_SPA--C	-0.452666			
_SWE--C	0.334286			
_UNK--C	0.263832			

Effects Specification
Cross-section fixed (dummy variables)
Weighted Statistics

R-squared	0.979837	Mean dependent var	1.857967
Adjusted R-squared	0.977833	S.D. dependent var	0.618558
S.E. of regression	0.066804	Sum squared resid	0.718503
F-statistic	453.8498	Durbin-Watson stat	0.432445
Prob(F-statistic)	0.0000	Second-Stage SSR	0.77292

Table B.3.1.13 Contôd

Instrument rank	18.0000		
Unweighted Statistics			
R-squared	0.957172	Mean dependent var	1.623932
Sum squared resid	0.816528	Durbin-Watson stat	0.356479
Second-Stage SSR	0.864292		

Table B.3.1.14 Estimation Results of Model XXIV

Dependent Variable: YD?
Method: Pooled IV/Two-stage EGLS (Cross-section weights)
Sample (adjusted): 1981 2008
Included observations: 28 after adjustments
Cross-sections included: 14
Total pool (unbalanced) observations: 388
Linear estimation after one-step weighting matrix
Instrument list: C POPT? INVD? EDUD? T?(-1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.27167	0.84834	-0.320237	0.749
T?	0.106538	0.045046	2.365087	0.0185
INVD?	0.001617	0.002743	0.589421	0.5559
EDUD?	-0.044892	0.012595	-3.564338	0.0004
@YEAR>1995	-0.364662	0.124374	-2.931992	0.0036
Fixed Effects (Cross)				
_AUS--C	0.176369			
_BLX--C	0.315763			
_DEN--C	0.587925			
_FIN--C	0.296347			
_FRA--C	-0.025387			
_GER--C	-0.166331			
_GRE--C	-0.542081			
_IRE--C	0.166681			
_ITA--C	-0.265454			
_NET--C	0.067104			
_POR--C	-0.542097			
_SPA--C	-0.500921			
_SWE--C	0.44873			
_UNK--C	0.028461			

Effects Specification
Cross-section fixed (dummy variables)

Weighted Statistics			
R-squared	0.857051	Mean dependent var	1.669356
Adjusted R-squared	0.850483	S.D. dependent var	0.405782
S.E. of regression	0.133194	Sum squared resid	6.564036
F-statistic	376.7159	Durbin-Watson stat	0.440198
Prob(F-statistic)	0.0000	Second-Stage SSR	2.508049
Instrument rank	18.0000		

Table B.3.1.14 Contôd

Unweighted Statistics			
R-squared	0.844114	Mean dependent var	1.635036
Sum squared resid	6.687049	Durbin-Watson stat	0.416859
Second-Stage SSR	2.871625		

B.3.2 Estimation Results of Trade Equation

Table B.3.2.1 Estimation Results of Model XXV

Dependent Variable: T?
Method: Pooled IV/Two-stage Least Squares
Sample: 1980 2008
Included observations: 29
Cross-sections included: 14
Total pool (unbalanced) observations: 403
Instrument list: C GDPT? D? INVD? EDUD? Y80D?

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-44.12667	1.381542	-31.94015	0.0000
YD?	0.152492	0.092976	1.64012	0.1018
GDPT?	1.316406	0.024465	53.80701	0.0000
D?	-0.664573	0.081236	-8.180739	0.0000

R-squared	0.884549	Mean dependent var	20.43044
Adjusted R-squared	0.883681	S.D. dependent var	1.700914
S.E. of regression	0.580106	Sum squared resid	134.2725
F-statistic	1016.829	Durbin-Watson stat	0.120185
Prob(F-statistic)	0.0000	Second-Stage SSR	134.5269
Instrument rank	6.0000		

Table B.3.2.2 Estimation Results of Model XXVI

Dependent Variable: T?
Method: Pooled IV/Two-stage Least Squares
Sample (adjusted): 1981 2008
Included observations: 28 after adjustments
Cross-sections included: 14
Total pool (unbalanced) observations: 389
Instrument list: C GDPT? INVD? EDUD? YD?(-1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-83.14678	1.221708	-68.0578	0.0000
YD?	0.114719	0.152381	0.75284	0.4520
GDPT?	1.971546	0.022435	87.87951	0.0000

Table B.3.2.2 Contôd

Fixed Effects (Cross)			
_AUSð C	0.810191		
_BLXð C	0.903329		
_DENð C	0.206831		
_FINð C	0.751392		
_FRAð C	-1.566458		
_GERð C	-1.154475		
_GREð C	1.285047		
_IREð C	1.126653		
_ITAð C	-0.855501		
_NETð C	0.365373		
_PORð C	0.506878		
_SPAð C	-0.731339		
_SWEð C	0.136502		
_UNKð C	-1.687637		
Effects Specification			
Cross-section fixed (dummy variables)			
R-squared	0.979219	Mean dependent var	20.49708
Adjusted R-squared	0.978383	S.D. dependent var	1.670244
S.E. of regression	0.245572	Sum squared resid	22.49393
F-statistic	1175.509	Durbin-Watson stat	0.595191
Prob(F-statistic)	0.0000	Second-Stage SSR	22.42291
Instrument rank	18.0000		

Table B.3.2.3 Estimation Results of Model XXVII

Dependent Variable: T?
Method: Pooled IV/Two-stage EGLS (Cross-section random effects)
Sample: 1980 2008
Included observations: 29
Cross-sections included: 14
Total pool (unbalanced) observations: 403
Instrument list: C GDPT? INVD? EDUD? D? Y80D?
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-73.84398	2.225146	-33.18612	0.0000
YD?	-0.497183	0.261284	-1.902845	0.0578
GDPT?	1.903437	0.023467	81.11173	0.0000
D?	-0.66362	0.255145	-2.600954	0.0096
Random Effects (Cross)				
_AUSð C	0.623849			
_BLXð C	1.142307			
_DENð C	0.338697			
_FINð C	0.750908			
_FRAð C	-1.292512			
_GERð C	-1.019976			

Table B.3.2.3 Contôd

_GREð C	0.211178		
_IREð C	1.183252		
_ITAð C	-0.993275		
_NETð C	0.502225		
_PORð C	0.294333		
_SPAð C	-0.738609		
_SWEð C	0.317271		
_UNKð C	-1.319647		
Effects Specification			
	S.D.	Rho	
Cross-section random	0.334512	0.5894	
Idiosyncratic random	0.279228	0.4106	
Weighted Statistics			
R-squared	0.939998	Mean dependent var	3.140677
Adjusted R-squared	0.939547	S.D. dependent var	1.179406
S.E. of regression	0.28968	Sum squared resid	33.48184
F-statistic	2170.981	Durbin-Watson stat	0.421089
Prob(F-statistic)	0.0000	Second-Stage SSR	32.212
Instrument rank	6.0000		
Unweighted Statistics			
R-squared	0.713074	Mean dependent var	20.43044
Sum squared resid	333.7033	Durbin-Watson stat	0.04225
Second-Stage SSR	331.1555		

Table B.3.2.4 Estimation Results of Model XXVIII

Dependent Variable: T?
Method: Pooled IV/Two-stage EGLS (Cross-section weights)
Sample (adjusted): 1981 2008
Included observations: 28 after adjustments
Cross-sections included: 14
Total pool (unbalanced) observations: 389
Linear estimation after one-step weighting matrix
Instrument list: C GDPT? INVD? EDUD? YD?(-1)

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-80.32528	1.214274	-66.15089	0.0000
YD?	-0.169461	0.1506	-1.125239	0.2612
GDPT?	1.92664	0.020657	93.26716	0.0000
Fixed Effects (Cross)				
_AUS--C	0.824174			
_BLX--C	1.005705			
_DEN--C	0.276685			
_FIN--C	0.740586			
_FRA--C	-1.477862			
_GER--C	-1.045381			
_GRE--C	1.094665			
_IRE--C	1.049697			

Table B.3.2.4

_ITA--C	-0.821542		
_NET--C	0.401056		
_POR--C	0.251849		
_SPA--C	-0.824249		
_SWE--C	0.209441		
_UNK--C	-1.577069		
Effects Specification			
Cross-section fixed (dummy variables)			
Weighted Statistics			
R-squared	0.985043	Mean dependent var	24.48277
Adjusted R-squared	0.984442	S.D. dependent var	10.34426
S.E. of regression	0.241238	Sum squared resid	21.70705
F-statistic	1618.941	Durbin-Watson stat	0.695115
Prob(F-statistic)	0.0000	Second-Stage SSR	21.95486
Instrument rank	18.0000		
Unweighted Statistics			
R-squared	0.978961	Mean dependent var	20.49708
Sum squared resid	22.77288	Durbin-Watson stat	0.576252
Second-Stage SSR	22.81669		

Table B.3.2.5 Estimation Results of Model XXIX

Dependent Variable: T?
Method: Pooled IV/Two-stage Least Squares
Sample (adjusted): 1981 2008
Included observations: 28 after adjustments
Cross-sections included: 14
Total pool (unbalanced) observations: 388
Instrument list: C GDPT? INVD? EDUD?
Lagged dependent variable & regressors added to instrument list
Convergence achieved after 9 iterations

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-81.72122	2.84931	-28.68106	0.0000
YD?	-0.348422	0.277068	-1.257535	0.2094
GDPT?	1.958657	0.051447	38.07124	0.0000
AR(1)	0.690981	0.035763	19.32102	0.0000
Fixed Effects (Cross)				
_AUS--C	0.786377			
_BLX--C	1.095345			
_DEN--C	0.467728			
_FIN--C	0.776584			
_FRA--C	-1.518898			
_GER--C	-1.111272			
_GRE--C	1.058337			
_IRE--C	1.15477			
_ITA--C	-0.853615			
_NET--C	0.371608			

Table B.3.2.5 Contôd

_POR--C	0.155433	
_SPA--C	-0.885837	
_SWE--C	0.273893	
_UNK--C	-1.613975	
Effects Specification		
Cross-section fixed (dummy variables)		

R-squared	0.989659	Mean dependent var	20.49486
Adjusted R-squared	0.989213	S.D. dependent var	1.671827
S.E. of regression	0.17364	Sum squared resid	11.18594
F-statistic	2196.433	Durbin-Watson stat	2.178128
Prob(F-statistic)	0.0000	Second-Stage SSR	11.29976
Instrument rank	20.0000		

Table B.3.2.6 Estimation Results of Model XXX

Dependent Variable: T?
Method: Pooled IV/Two-stage EGLS (Cross-section weights)
Sample (adjusted): 1981 2008
Included observations: 28 after adjustments
Cross-sections included: 14
Total pool (unbalanced) observations: 388
Iterate coefficients after one-step weighting matrix
Instrument list: C GDPT? INVD? EDUD? YD?(-1)
Lagged dependent variable & regressors added to instrument list
Convergence achieved after 17 total coef iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-72.78857	2.827873	-25.73969	0.0000
YD?	-0.692859	0.226311	-3.061536	0.0024
GDPT?	1.799559	0.05006	35.94793	0.0000
AR(1)	0.71963	0.03417	21.06042	0.0000
Fixed Effects (Cross)				
_AUS--C	0.731653			
_BLX--C	1.181091			
_DEN--C	0.486784			
_FIN--C	0.656981			
_FRA--C	-1.273967			
_GER--C	-0.805793			
_GRE--C	0.730763			
_IRE--C	0.944322			
_ITA--C	-0.690427			
_NET--C	0.416384			
_POR--C	-0.274414			
_SPA--C	-0.935775			
_SWE--C	0.329193			
_UNK--C	-1.328067			

Table B.3.2.6 Contôd

Effects Specification			
Cross-section fixed (dummy variables)			
Weighted Statistics			
R-squared	0.992522	Mean dependent var	25.1705
Adjusted R-squared	0.992199	S.D. dependent var	11.11061
S.E. of regression	0.17019	Sum squared resid	10.74589
F-statistic	2992.681	Durbin-Watson stat	2.075762
Prob(F-statistic)	0.0000	Second-Stage SSR	11.04768
Instrument rank	20.0000		
Unweighted Statistics			
R-squared	0.98944	Mean dependent var	20.49486
Sum squared resid	11.42245	Durbin-Watson stat	2.184807
Second-Stage SSR	11.52296		

Table B.3.2.7 Estimation Results of Model XXXI

Dependent Variable: T?
Method: Pooled IV/Two-stage EGLS (Cross-section weights)
Sample (adjusted): 1981 1995
Included observations: 15 after adjustments
Cross-sections included: 14
Total pool (balanced) observations: 210
Iterate coefficients after one-step weighting matrix
Instrument list: C GDPT? INVD? EDUD? YD?(-1)
Lagged dependent variable & regressors added to instrument list
Convergence achieved after 17 total coef iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-74.26282	3.279531	-22.64434	0.0000
YD?	-1.526467	0.361069	-4.227634	0.0000
GDPT?	1.852863	0.058074	31.90503	0.0000
AR(1)	0.483677	0.060972	7.932739	0.0000
Fixed Effects (Cross)				
_AUS--C	1.181464			
_BLX--C	1.606882			
_DEN--C	0.691447			
_FIN--C	0.684739			
_FRA--C	-1.243996			
_GER--C	-0.593211			
_GRE--C	0.274033			
_IRE--C	0.551894			
_ITA--C	-0.737962			
_NET--C	0.715896			
_POR--C	-1.030234			

Table B.3.2.7 Contôd

_SPA--C	-1.497357		
_SWE--C	0.584713		
_UNK--C	-1.188309		
Effects Specification			
Cross-section fixed (dummy variables)			
Weighted Statistics			
R-squared	0.991078	Mean dependent var	28.74614
Adjusted R-squared	0.990338	S.D. dependent var	16.84968
S.E. of regression	0.198306	Sum squared resid	7.589773
F-statistic	1425.86	Durbin-Watson stat	1.960589
Prob(F-statistic)	0.0000	Second-Stage SSR	7.136031
Instrument rank	20.0000		
Unweighted Statistics			
R-squared	0.983691	Mean dependent var	19.63968
Sum squared resid	7.90503	Durbin-Watson stat	1.88327
Second-Stage SSR	7.426841		

Table B.3.2.8 Estimation Results of Model XXXII

Dependent Variable: T?
Method: Pooled IV/Two-stage EGLS (Cross-section weights)
Sample: 1996 2008
Included observations: 13
Cross-sections included: 14
Total pool (unbalanced) observations: 178
Iterate coefficients after one-step weighting matrix
Instrument list: C GDPT? INVD? EDUD? YD?(-1)
Lagged dependent variable & regressors added to instrument list
Convergence achieved after 23 total coef iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-75.57952	5.158827	-14.65052	0.0000
YD?	-0.441919	0.251949	-1.754	0.0813
GDPT?	1.845459	0.092086	20.04056	0.0000
AR(1)	0.605823	0.06324	9.579701	0.0000
Fixed Effects (Cross)				
_AUS--C	0.517382			
_BLX--C	0.971743			
_DEN--C	0.479651			
_FIN--C	0.84339			
_FRA--C	-1.307167			
_GER--C	-1.075282			
_GRE--C	0.977055			
_IRE--C	1.134063			

Table B.3.2.8 Contôd

_ITA--C	-0.776595		
_NET--C	0.197466		
_POR--C	0.229326		
_SPA--C	-0.686302		
_SWE--C	0.306986		
_UNK--C	-1.51272		
Effects Specification			
Cross-section fixed (dummy variables)			
Weighted Statistics			
R-squared	0.992676	Mean dependent var	25.9477
Adjusted R-squared	0.991948	S.D. dependent var	9.215748
S.E. of regression	0.127128	Sum squared resid	2.602021
F-statistic	1311.951	Durbin-Watson stat	1.793071
Prob(F-statistic)	0.0000	Second-Stage SSR	2.704178
Instrument rank	20.0000		
Unweighted Statistics			
R-squared	0.990071	Mean dependent var	21.50378
Sum squared resid	2.603362	Durbin-Watson stat	1.849341
Second-Stage SSR	2.654428		

Table B.3.2.9 Estimation Results of Model XXXIII

Dependent Variable: T?				
Method: Pooled IV/Two-stage EGLS (Cross-section weights)				
Sample (adjusted): 1981 2008				
Included observations: 28 after adjustments				
Cross-sections included: 14				
Total pool (unbalanced) observations: 388				
Iterate coefficients after one-step weighting matrix				
Instrument list: C GDPT? INVD? EDUD? YD?(-1)				
Lagged dependent variable & regressors added to instrument list				
Convergence achieved after 17 total coef iterations				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-128.7933	27.92318	-4.612416	0.0000
YD?	-0.505763	0.456153	-1.108758	0.2683
GDPT?	2.870237	0.535506	5.35986	0.0000
@YEAR>1995	-1.231533	0.678286	-1.815653	0.0702
AR(1)	0.746919	0.038227	19.53914	0.0000
Fixed Effects (Cross)				
_AUS--C	1.29735			
_BLX--C	1.379181			
_DEN--C	1.243276			
_FIN--C	1.713881			

Table B.3.2.9 Contôd

_FRA--C	-2.763292		
_GER--C	-2.673291		
_GRE--C	1.839275		
_IRE--C	2.462584		
_ITA--C	-1.944769		
_NET--C	0.298257		
_POR--C	1.099355		
_SPA--C	-1.426184		
_SWE--C	0.596518		
_UNK--C	-2.925114		
Effects Specification			
Cross-section fixed (dummy variables)			
Weighted Statistics			
R-squared	0.975639	Mean dependent var	21.08489
Adjusted R-squared	0.974519	S.D. dependent var	3.741174
S.E. of regression	0.276491	Sum squared resid	28.28557
F-statistic	2435.339	Durbin-Watson stat	1.977112
Prob(F-statistic)	0.0000	Second-Stage SSR	10.28467
Instrument rank	21.0000		
Unweighted Statistics			
R-squared	0.973893	Mean dependent var	20.49486
Sum squared resid	28.2386	Durbin-Watson stat	1.977204
Second-Stage SSR	11.0174		

B.4 The Graphs of the Data Used in Estimation Equations

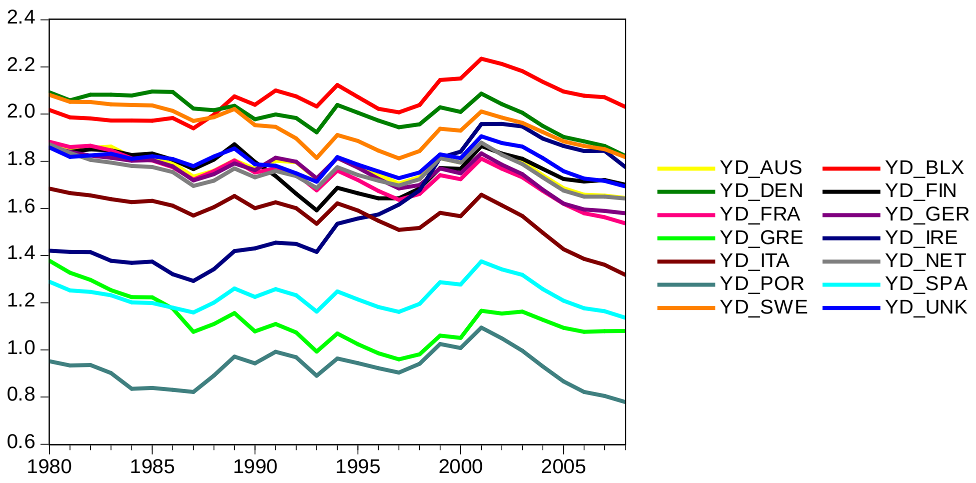

Figure B.1 The absolute value of the difference in log of Turkeyôs per capita income and log of country jôs per capita income (YD)

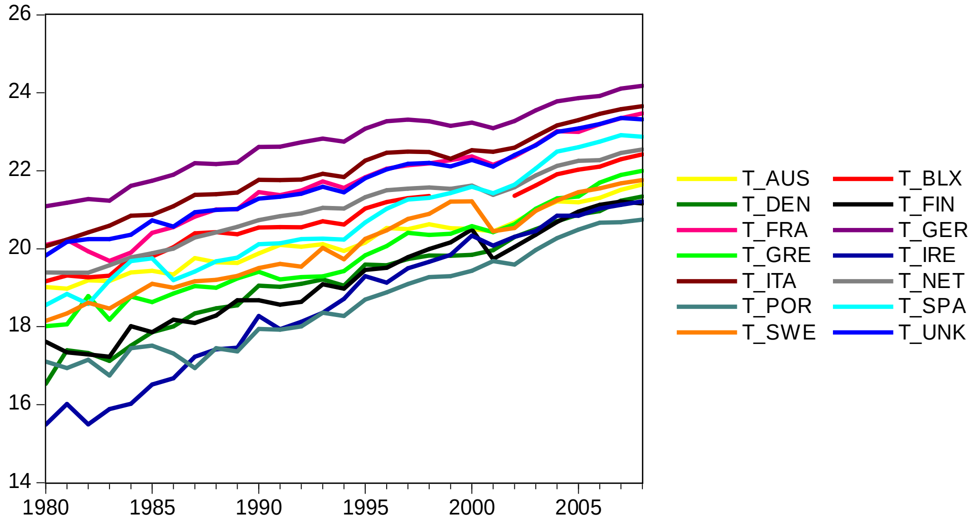

Figure B.2 The log of the trade volume (exports+imports) between Turkey and country j (T)

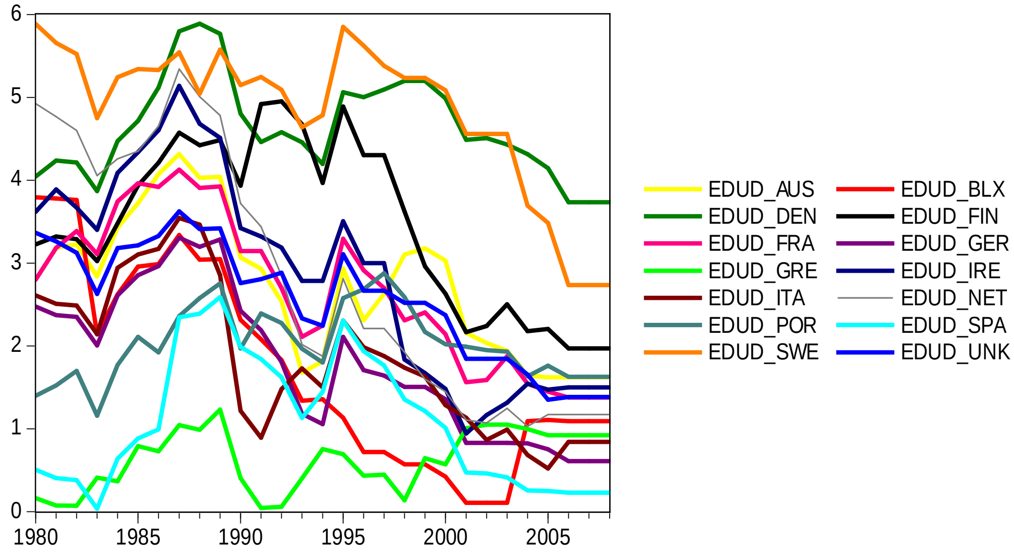

Figure B.3 The absolute value of the difference in education expenditure (%of GNI) of Turkey and education expenditure (%of GNI) of country j (EDUD)

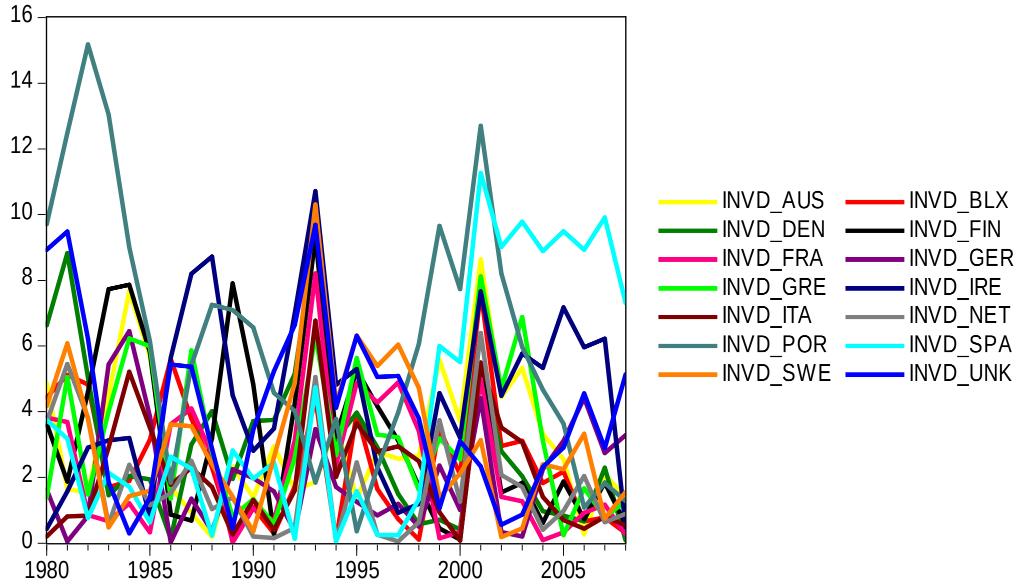

Figure B.4 The absolute value of the difference in investment share (%of GDP) of Turkey and investment share (%of GDP) of country j (INVD)

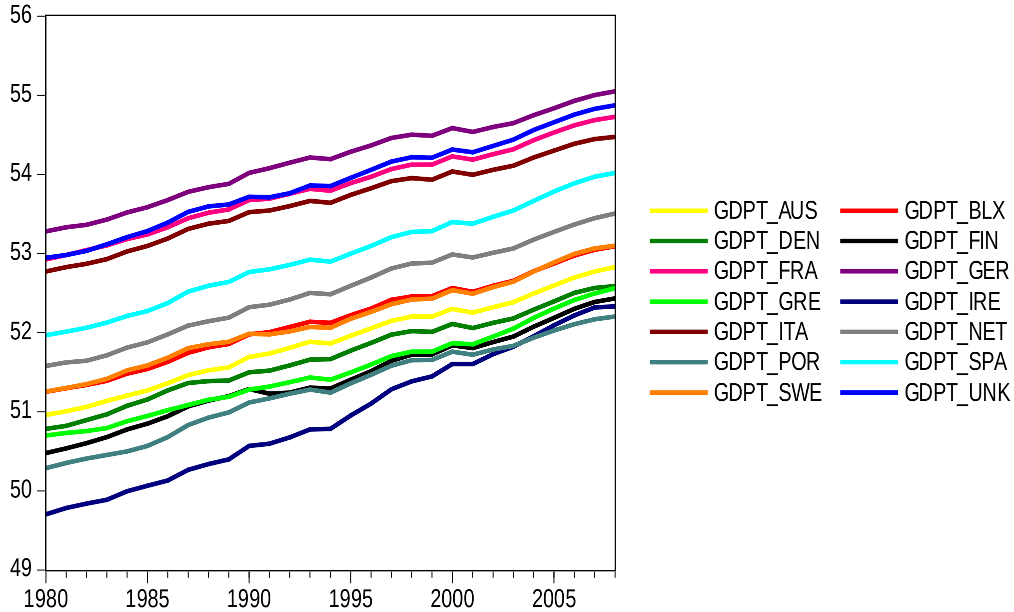

Figure B.5 The sum of log of Turkeyôs total GDP and log of country jôs total GDP (GDPT)

APPENDIX C

TURKISH POPULATION IN EU-15 COUNTRIES

Table C.1 Turkish Population in EU-15 Countries (% of Total Population, 2009)*

NETHERLANDS	2,25
GERMANY	2,03
AUSTRIA	1,32
DENMARK	1,03
FRANCE	0,73
SWEDEN	0,73
GREECE	0,43
BELGIUM	0,37
BELGIUM&LUXEMBOURG**	0,35
FINLAND	0,11
LUXEMBOURG	0,09
UNITED KINGDOM	0,09
ITALY	0,03
IRELAND	0,03
SPAIN	0,01
PORTUGAL	0,01

* Turkish population in EU-15 countries were obtained from Ministry of Labour and Social Security of Turkey. The share of Turkish population in EU 15 countries as a percentage of total population were calculated by the author.

** For Belgium&Luxembourg the share of Turkish population in total population was calculated by dividing the sum of Turkish population in Belgium and Turkish population in Luxembourg to the sum of total populations of Belgium and Luxembourg.