SPATIAL EFFECTS OF TRADE OPENNESS: REGIONAL INEQUALITY, TRADE OPENNESS AND LIBERAL TRADE POLICIES IN TURKEY

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ABSTRACT

SPATIAL EFFECTS OF TRADE OPENNESS:
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Aim of the present thesis is to investigate the impact of trade liberalization on the evolution of regional income inequalities in Turkey between 1975 and 2011. Despite the large body of literature on this subject, there exist several directions which need to be further explored. i. so far in the literature, the concept of trade openness is too broadly defined. However, it is not only 'trade' per se that can affect the regional economies but the composition of trade is also of great importance (Rodriquez-Pose and Gill, 2006). Indeed, it can be partitioned into several components, such as exports and imports (or manufacturing and agricultural trade). We analyze separately the impact of each component on the evolution of regional inequalities. ii. in most of the empirical studies dealing with this issue, neighboring regions are assumed to have no spatial economic interconnection between each other. We, therefore, incorporate spatial spillovers of trade and growth into our analysis. Our results can be summarized in three groups: First, regional inequalities tend to decline over the period of analyses. Second, initially poorer regions that experience an export-based liberalization (particularly in manufacturing goods, not in agricultural goods) tend to grow faster than richer ones. Imports, on the other hand, have an opposite effect. Third, the spatial spillovers of growth are found to evident across regions. Such that, growth in a region spilled over to the neighboring ones, positively.

ÖZET

DIŞA AÇIKLIĞIN MEKANSAL ETKİLERİ;
TÜRKİYE'DE BÖLGESEL EŞİTSİZLİK, DIŞA AÇIKLIK VE
LİBERAL TİCARET POLİTİKALARI

Bu çalışmanın amacı, Türkiye'deki dış ticarete açılma sürecinin bölgesel gelir eşitsizliğine olan etkisini araştırmaktır. Yazında, bu konu ile ilgili yapılmış birçok çalışma bulunsa da literatürde eksik kalmış veya değinilmiş kısımlar da vardır. Örneğin, benzer çalışmalarda literatür "dış ticaret" kavramını çok bütünsel olarak ele almış ve içeriğini genellikle göz ardı etmiştir. Bu bağlamda dış ticareti oluşturan ithalat ve ihracat'ın farklı olabilecek etkileri ayrıştırılmalıdır. Benzer bir biçimde, tarımsal ticaretin sanayi bazlı ticaretten farklı etkileri olacağı düşünülmelidir. Diğer bir katkı sunduğumuz nokta ise bu konudaki araştırmalarda çokça göz ardı edilen mekânsal etkileri (Spatial Spillovers) regresyon analizlerimizde kullanarak, hem dış ticaretin serbestleşme sürecinde yarattığı mekânsal ekonomik etkileri gözlemleme imkanı bulduk, hem de metot olarak daha doğru ve güvenilebilir tahminler yapabildik. Çalışmanın bulguları üç ana başlıkta özetlenebilir. Birincisi, Türkiye'de bölgeler arası gelir eşitsizliği 1975'ten 2011'e düşüş eğilimindedir. İkincisi, ihracat odaklı olan ve özellikle ihracatını imalat sanayi üzerine yoğunlaştıran düşük gelirli bölgeler zengin bölgelere yakınsamaktadır. Üçüncüsü, bölgesel büyümenin mekânsal bir yayılma şeklinde ilerlediği gözlenmiştir.

To my family..

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LIST OF ABBREVIATIONS

AK Party	Justice and Development Party
CC	Cumulative Causation Theory
COAST	Coastal Regions
CV	Coefficient of Variation
EAST	Eastern Regions
EG	Endogenous Growth
EU	European Union
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GVA	Gross Value Added
INTERIOR	Interior Regions
LSDV	Least Squares Dummy Variable
NAFTA	North American Free Trade Agreement
NC	Neo-Classical
NEG	New Economic Geography
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organization for Economic Co-operation and Development
OIC	Organization of Islamic Cooperation
OLS	Ordinary Least Squares
PRD	Priority Region for Development
R&D	Research and Development
SWW	Second World War
THEIL	Theil Index
TUIK	Turkish Statistical Institute
US	United States
WCV	Weighted Coefficient of Variation
WEST	Western Regions

CHAPTER 1

INTRODUCTION

1.1. Problem Definition

Regional convergence is a dynamic research topic for economists, planners and economic geographers. A great number of studies have been conducted around the world in order to examine whether regional income inequalities manifest a tendency to decline over the decades (Barro and Sala-i-Martin, 1991, Barro and Sala-i-Martin, 1992, some others). Yet there is no consensus in the literature on whether regional income inequalities are converging or diverging. Indeed, there has been a number of reasons discussed to understand the observed regional disparities and lack of income convergence such as inadequate level of fixed investments, human capital, infrastructure, social capital, innovation, R&D and public investments in backward regions. From another perspective, economic and trade policies might well be influencing the regional imbalances by favoring either the developed metropolitan or lagging regions. In fact, trade liberalization is a concurring topic.

Since the 1960s, international free trade has widely been recognized as promoting the economic growth in a variety of theoretical and empirical models (Frankel and Romer 1999, Dollar and Kraay 2004). Most influential, Hecksher-Ohlin-Samuelson theory suggests that trade liberalization is likely to bring about substantial productivity gains by pushing countries to specialize according to their comparative advantage and relocating the production factors between tradable and non-tradable sectors (Daumal and Ozyurt 2011, Ozyurt and Daumal 2011). In a similar vein, it is expected to induce the productivity by easing the transmission of know-how and technology spillovers among the trading partners (Grossman and Helpman 1991, Coe and Helpman 1995). Opening up to the markets may also increase the internal competition that, possibly, forces local firms to improve their operational and managerial efficiency and upgrade their production systems (Fu 2004, Daumal and Ozyurt 2011).

Although merits of trade are well known at the country level, its varying impact on regional economies remains largely ambiguous (Rodriquez-Pose 2012). In other words, not all regions within a country can equally benefit from trade liberalization. In contrast, some of them are likely to generate greater benefits that contribute to the widening or reduction of interregional disparities (Elveren 2010).

Despite its importance, the debate on the link between trade openness and regional inequality has not yet been conclusive in the literature (Brülhart 2011).

However, a class of NEG (New Economic Geography) models argue that trade liberalization is likely to contribute to the reduction of disparities (Krugman and Elizondo 1996). According to this claim, as a country opens its markets to trade; core regions tend to become less attractive for firms (Ozyurt and Daumal 2011). Since land costs, internal competition, congestion and labor costs are high in large metropolitan areas, advantages created by locational concentration cannot exceed these costs (Ozyurt and Daumal 2011). Hence, firms prefer to relocate and move towards peripheral regions in search of a higher profit margin and finer economic climate (Fan and Casetti 1994, Rodriquez-Pose and Gill 2006). Such a diffusion process is likely to foster the economic growth in backward regions and contribute to the reduction of income disparities (Krugman and Elizondo 1996).

On the other hand, a group of scholars adopt a counter view by arguing that trade liberalization provides additional benefits to developed regions (Gonzales Rivas 2007, Myrdal 1957, Crozet and Koenig 2004). The rationale behind this claim is attributed to the advantages of agglomeration and centripetal effects of trade openness (in accordance with Myrdal (1957)). Such that, developed regions which have low cost access to foreign markets, competitive advantages and highly mobile work force benefit from the increasing returns to scale created by agglomeration. Indeed, during the liberalization process firms tend to move towards metropolitan areas that promotes cumulative growth process. In contrast, peripheral places can hardly benefit this ever-growing process. Thus, inequalities between rich and poor regions tend to widen over time (Henderson and Kuncoro 1996, Aghion et al. 2004).

On empirical grounds, findings are also far from a clear cut. A class of scholars including Brülhart et al. (2010) and Daumal (2013) focus on regional disparities respectively within Austria and Brazil and report evidence in favor of reductive effect of trade on regional inequalities. Controversially, several others, including Daumal and Ozyurt (2011), Daumal (2013), Rivas (2007), Oktay and Gozgor (2013), Kanbur and

Zhang (2005) , Pernia and Quising (2003) are the authors who find a positive impact of trade liberalization on spatial disparities respectively for Brazil, India, Mexico, Turkey, China and Philippines.

Despite the large body of literature on this subject, there exist several directions which need to be further explored:

First, although researchers mainly focused on emerging economies like Brazil, India and Mexico, the literature focusing on Turkey is rather scarce. In fact, Turkey is a country that includes large socio-economic and territorial imbalances as well as diverse economic structure and labor force across regions (Yıldırım et al. 2009, Gezici, and Hewings 2007). Hence, tackling the spatial disparities and maintaining the economic and social cohesion is one of the major political concerns.

In addition, Turkey has experienced a period of rapid liberalization over the last few decades. From 1970s to 2000s, policies favoring the economic liberalization have been implemented. Such that the main growth strategy has switched from an import substitution approach to an export-led growth. Hence, we think it is crucial to identify the winners and losers of this process to be able to provide relevant insights to policy makers which one of the major targets of the present study.

Second, so far in the literature, the concept of trade openness is too broadly defined. In reality, trade can be partitioned into several components, such as exports and imports (or manufacturing and agricultural trade). In fact, each component can have far different effect on regional economies. In support of this argument, Rodriquez-Pose and Gill (2006) suggests that it is not only 'trade' per se that affect the regional inequality but the composition of trade is also of great importance. As trade shifts from manufacturing to agriculture (or from exports to imports) or vice versa, the implications on regional growth patterns can significantly change (Leichenko and Silvia, 2004). For these reasons, we intend to analyze separately the impact of each component on the evolution of regional inequalities.

Third, in most of the empirical studies dealing with this issue, regions are assumed to have no economic interconnection between each other. In contrast, spatial spillovers of trade and income among the economic systems are well documented in the literature (Ertur and Koch, 2007). Thus, we find it useful to incorporate the spatial factors into our analysis. Failing to do so, might in fact lead to distorted results due to a neglected spatial dependence.

1.2. Aim of Study

The aim of the present thesis is to investigate the impact of trade liberalization on the evolution of regional inequalities in Turkey by adopting the perspectives in 1-1. In terms of spatial units, we mostly focus on the NUTS-2 (Nomenclature of territorial units for statistics) level regions for a period between 1975 and 2011. Data used in this paper is mostly obtained from TUIK (Turkish Statistical Institute) with the exception of regional GDP (Gross Domestic Product) and population series for 1975-2000 period that are obtained from Karaca (2004), Özötün (1980,1988) and Kasman and Turgutlu (2009) to whom we are heartily grateful.

The main hypothesis of this study is that attributes of further trade is crucial for the regional growth, especially, components of trade like export and import, and/or sectorial decomposition of trade like manufacturing and agriculture, have key roles in the growth patterns of the regions. With this regard, the first sub hypothesis is that export oriented poor regions grow more since export motivates regions to further production, and surely, further employment. The second sub hypothesis is that manufacturing export orientated poor regions grow more since manufacturing leads to more dynamic production based regional economies.

Ultimately, several research questions are addressed;

i)   Are regions converging or diverging? In terms of per capita income? In terms of per labor income? How large are the income disparities between regions?

ii) Does increasing trade openness lead to higher growth rates in poorer regions?

iii) Does increasing specialization in exports rather than import lead to higher growth rates in poorer regions?

iv) Does increasing specialization in export of manufacturing (or agricultural) goods lead to higher growth rates in poorer regions?

v)   How do control variables such as regional level of human capital, infrastructure, private and capital investments shape these processes?

1.3. Methodology

The thesis follows a quite quantitative approach. Our empirical analyses targets mainly two types of analyses. Firstly, we address whether regional income disparities

are large and decreasing or increasing over time. In order to do this, we apply several time series tools such as inequality indices like Theil, coefficient of variation (simple and population weighted). Moreover, we apply a unit root test (like Augmented Dickey Fuller test) to understand whether disparities tend to display a tendency to increase/decrease over time (sigma-convergence). Explanatory tools like maps are commonly used during the study, not only to show disparities in income but also in other important variables like education, human capital, infrastructure and investments. Lastly, a spatial regression approach has also been adopted to test the income convergence patterns (beta-convergence).

Apart from these, we apply several spatial tests and methods like Moran I tests, Moran scatter plots in order to analyze the spatial autocorrelation and patterns in regional incomes and growth. Accordingly, convenient types of spatial weight matrices are adopted.

In the second type of analysis, we analyze whether trade openness promote the regional convergence / divergence? In order to do so, we employ spatial panel models which are as useful as popular as they combine the spatial (cross-sectional) dimension with time series dimension and increase the number of observations in this way. Moreover, they are useful in capturing region and time specific effects. To do so, we apply one of simplest forms of fixed effects model, namely LSDV (Least Squares dummy variable) model. Using this model, we estimate the impact of initial income, export and import intensity, level of human capital, infrastructure and investments on the regional growth patterns (dependent variable). Also, we estimate the model using Spatial Durbin Models which are quite useful methods in capturing spatial interactions among neighboring regions in either dependent and/or error terms or their impacts on the dependent variables. Apart from these methods, graphical illustrations have also been largely used.

In terms of spatial units, we concentrate on Nuts-I, Nuts-II and Nuts-III level regions as long as the data is available from 1975 to 2011. For the first type of analyses, we use all three spatial units. However, for the second types of analyses (panel models), we use only Nuts-II level regions and for period of 2004-2011 since many variables are available only for these years. We obtain most of our datasets from TUIK (Turkstat).

In terms of software and programs, we use a range of tools like GeoDA, QGIS, ARCGIS 10.1, EVIEWS 6, R 2.13 (SPDEP, SP, SPLM) packages and Excel.

1.4. Structure of Study

This thesis consists of 5 chapters. The following chapter (2) deals with the theoretical framework behind the issues of regional convergence and trade openness. Specifically, it explains thoroughly various theories of regional growth, inequality and international trade. It, therefore, provides theoretical background on the link between regional growth, convergence and trade openness. In addition, it also documents a summary of empirical literature on regional convergence in the world (i.e. on various countries like US, EU)

The third chapter focuses, instead, on the literature in this field on Turkey; firstly it gives an itemized background about Turkish economy and its historical progress regarding the regional inequalities and trade liberalization. Then, it continues to inform the reader by focusing on the empirical Turkish literature on regional inequality; a detailed summary of the literature that covers these issues is provided. In the final part of third chapter, the summary of the literature on the link between trade and economic growth in Turkey is examined.

The fourth chapter focuses on our empirical analysis and results. It is organized in five parts. In 4.1, we explain our dataset and variable selection for empirical models. In 4.2, we analyze empirically the evolution of regional income inequalities (using mostly sigma convergence and other explanatory tools). In 4.3 we implement a similar type of analysis for the historical evolution of trade liberalization process in Turkey. In 4.4, we explain our empirical spatial and panel data models, by performing various spatial tests and estimate the models. Finally, in 4.5, we summarize our estimation results and provide economic discussions on them.

The final chapter is devoted to summarizing briefly the research outcomes and policy implications. This chapter discusses the importance of trade openness regarding the regional growth and inequality. It also gives recommendations associated with promoting growth especially in backward regions based on the outputs of the trade types and regional growth mechanisms.

CHAPTER 2

THEORATICAL FRAMEWORK

The current chapter is devoted to summarizing the theoretical framework behind our empirical analyses. Respectively, in section 2.1 we focus on economic and regional growth theories in historical order; Neo-Classical (NC) model; a range of endogenous models; New Economic Geography (NEG); Cumulative Causation (CC) Model; Growth Pole Theory and Marxists Views. In section 2.2, we provide a basis for trade openness theories and economic growth, by documenting international trade theories and economic growth. Section 2.3 has been devoted to summarizing the regional convergence debate by providing types of income convergence and its empirical methods.

2.1. Regional Growth Theories

2.1.1. Neo-Classical Growth Theory

According to the NC growth model, developed by Solow (1956), the increase in per capita income depends to the capital stock accumulation and technological development. The diminishing return to the capital requires the technological improvement as the essential requirement for the long term growth. The diminishing return to the capital can be defined as the decreasing effect of the capital on production due to an increase in the capital stock.

Due to the technological development in the model of Solow that works, exogenously, so, the model does not suggest a long term growth unless there is an external positive shock to the technology.

The main message of this theory is that all economies accumulate their capital and grow in per capita terms until the steady state. At the steady state, they do not grow anymore unless there is a technological improvement (Korres, 2012, Solow, 1956). Economies are predicted to grow faster in the earlier times of capital accumulation and

slowdown afterwards, since the capital has a diminishing returns (i.e. losing its productivity as it accumulates) over time (Solow, 1956).

From a regional perspective, as these predictions hold, poorer regions which have low level of capital accumulation grow faster than richer ones and all regions converge to a same steady state and equalize the level of per capita income. This is called as absolute convergence (Barro and Sala-I Martin 1991, Barro and Sala-I Martin 1992).

For achieving the same steady state, the model assume that all the regions or nations have the same production functions, technological and structural institutional factors, for instance, same population growth rate, saving rate etc. In the beginning, there might be some differences between regions regarding the income differences caused by the distribution of the production functions. Then, this gap will decrease due to the mobility of the factors, from the regions that have abundant factors to the regions that have limited factors (Korres, 2012).

The model of Solow (1956) assumes that the regional income inequality will be disappearing absolutely, if and only if these assumptions are valid. And the disappearance of the inequality is called as "absolute convergence". In the case of the different assumptions such as different production functions, technological and structural or institutional factors, all regions will be converge to the different level of steady state, and, contrary to the absolute convergence, the gap between the regions will never disappear but the income inequality will decrease, and there will be a "conditional convergence" pattern across the regions (Korres, 2012).

In detail, NC model relies on the following production function (Solow, 1956):

$$Y = F(K, L) = AK^{\alpha}L^{1-\alpha} \qquad (1)$$

where Y is output (or income), A is the level of technology (knowledge), L is the labor. It has been known as Cobb-Dougles production function, where α is the marginal productivity of capital. There is a constant returns to scale as $\alpha + 1 - \alpha = 1$. In per capita terms, the function takes the following form:

$$y = F(K, L) = Ak^{\alpha} \qquad (2)$$

where k is per capita level of capital and y is the per capita income.

Once more, the main prediction of the model is that per capita output will grow until the equilibrium. However, economies which has initially lower k will grow faster than richer ones as $0<\alpha<1$ and there is a diminishing returns to scale. Hence, all economies (i.e. regions) will converge to the same steady state and equalize the level of per capita prosperity (Barro and Sala-I Martin 1991, Barro and Sala-I Martin 1992, Solow, 1956).

2.1.2. Endogenous Growth Models

Endogenous growth (EG) models suggest that endogenous factors leads to economic growth as a criticism to the NC model which stress the role of only exogenous technological developments (Romer 1986, Romer 1994, Barro 1991, Lucas 1988). According to the EG models the investment in human capital, innovation, public investments (i.e. infrastructure) and knowledge are significant and the key contributors to economic growth (Romer 1986, Romer 1994, Barro 1991, Lucas 1988). The EG models stress the importance of the advantageous and diffusion effects of knowhow oriented economy regarding their contribution to economic development in the long run.

Romer (1994) distinguishes the endogenous growth from the neoclassical growth by stressing that the economic growth is basically based on the power of the endogenous components of an economic system, and it is not related with the external forces coming from outside the system. He suggests that neo classic model is not sufficient and capable to explain the different growth patterns across the countries.

Within this regard, each scholar has emphasized a different role of an economic factor that gives rise to endogenous and sustained long-run growth. The main difference between NC and EG model is that neo-classical model results in zero per capita growth rate over the long-run while in endogenous system a positive growth rate is sustained.

The class of models in this stream can be partitioned into three main models.

Romer's Model

According to Romer (1994), long-run growth can be achieved through endogenous improvements in technology and innovations. Technological improvement progress can be done in three ways. First assumption is that the technological

development can be derived from the learning by doing process, unintentionally. For instance, operators or a mechanics can improve their skills by their tacit knowledge and practice, while they never work with the motivation for developing or inventing new technology (Arrow, 1962). By developing this argument, second, assumption is that the technological development depends on the professional Research and Development (R&D), intentionally (Romer, 1994). Romer (1994) assumes that part of the population work as researcher and develop new technologies and this process bring the technological improvement as an output of knowledge (Romer, 1994). Lastly, technology spillovers also lead to improvement of the technology level, both unintentionally and intentionally.

This endogenous growth process can be summarized in a following way:
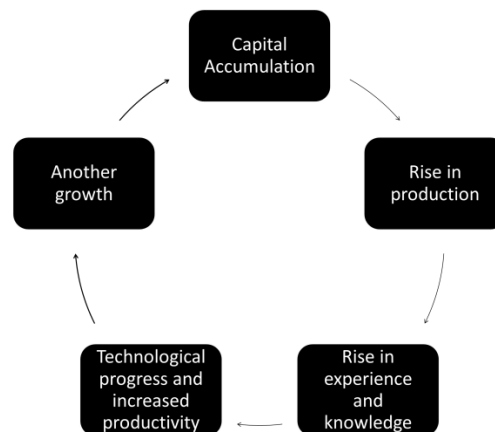
Figure 2.1. Romer's growth cycle I
(Source: Romer, 1994)

In the above scheme (Figure 2.1), endogenous growth can be achieved via unintentional technical progress. As the capital accumulates, the production will rise which will bring unintentionally gained experience and knowledge (i.e. learning by doing) and promote productivity and growth (Romer, 1994).

In the intentional model below (Figure 2.2), technology and intentional R&D investments is the driving force of the economy and, surely, they are not constant. Technological progress, caused by the new investments and subsidies for the R&D, positively affects both the quality and the quantity of the products by the increased productivity. This increase in the production also leads to progress in technology due to the additional production gives an opportunity to make new investments in R&Ds. The

chart depicts the circular process that is triggered by the improvements in the technology level.
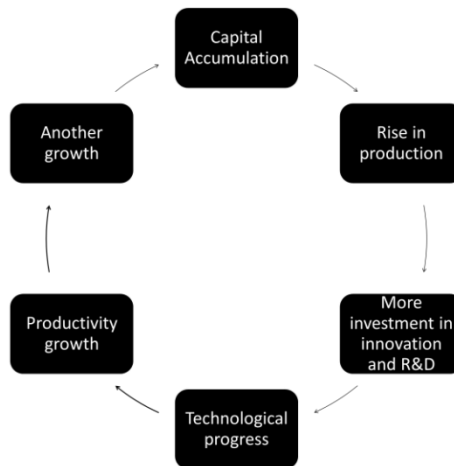
Figure 2.2. Romer's growth cycle II
(Source: Romer, 1994)

Lucas' Model

Differently from Romer, Lucas's (1988) model emphasizes the role played by human capital and investments in education. He argues that self-sustained economic growth can be achieved by investing in human capital. With this regard, he considers the following production function (Lucas, 1988):

$$Y = AK^{\alpha} L^{1-\alpha} = AK^{\alpha}(uhN)^{1-\alpha} h_a^{\gamma} \tag{3}$$

where *A* is the level of technology, *K* denotes capital, *N* is total labor force, *h* is the level of skills *u* is the time devoted to work for production. h_a captures the externality effects created by human capital.
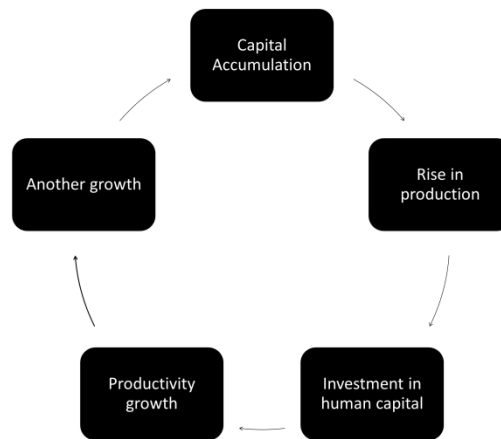
Figure 2.3. Lucas' growth cycle
(Source: Lucas, 1988)

In this model, he summarizes this kind of process; as the capital accumulates, more production occurs, more production creates additional resources to be used in human capital investments (like universities; training programs etc.) (Figure 2.3). Then, this will bring an additional productivity gain and create another output growth. Hence, in the long-run, economy will grow at a positive rate, as long as investments in human capital provide externalities.

Barro's Model

Barro (1990) considers a model where government expenditure is major endogenous force for growth in an economy. Growth of an economy can be sustained by public investments such as infrastructure, ports, airports, transportation networks, nuclear plants etc. Government spending is basically financed by a straight income tax. Since the investments in infrastructure etc. lead to rise in the productivity of the private production, taxes can trigger or extinguish the growth pattern in an economy. Barro (1990) points out the existence of this positive correlation between government spending and long run economic growth by modeling the private productivity, government spending and taxes.

The model of Barro (1990) relies on the following function (Barro, 1990);

$$Y = AK^{\alpha} L^{1-\alpha} = AK^{1-\alpha} g^{\alpha}, \quad g = \tau y \qquad (4)$$

where *g* is government spending, τ is tax rate, α is marginal productivity of government spending. In this model, both the firms and consumers try to maximize their profits and utility by their production and utility functions. Governments invest some of its sources to the infrastructure such as ports, roads etc. Hence, a following system (Figure 2.4) occurs in the economy:
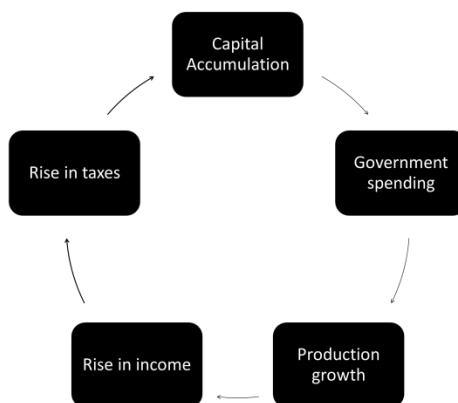
Figure 2.4. Barro's growth cycle
(Source: Barro, 1990)

Barro (1990) suggest a circular mechanism, similar to Lucas and Romer, between government spending and growth which is based on that government spending leads to rise production, rise in income, rise in taxes, rise in capital accumulation and rise in government spending, interacted and effected with each other, respectively. This process creates a positive externality in steady state and this positive externality cause the growth.
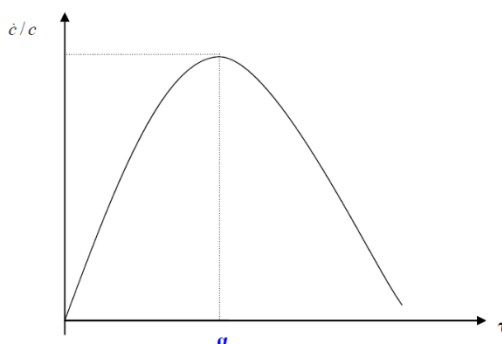
Figure 2.5. Optimal tax rate for consumption and production
(Source: Barro, 1990)

Of course, the tax rate should be optimal for both producers and consumers. The graph depicts the maximized level of consumption ensured by growth; the tax rate is achieved at α optimal level. Moving from the optimal point to the both directions will affect the growth negatively, if tax rate is less than the optimal point, which means government will have relatively low level of tax income which also means that government spending for infrastructure and services will be inadequate. On the other hand, if the tax rate is more than the optimal point, in this case, consumers will have a low level of sources to make expenditure and that means low level of demand in the economy. Hence, given a reasonable level of taxation, government spending can provide an additional externality and economic growth in the long-run.

2.1.3. New Economic Geography

Questioning whether the growth is a result of endogenous factors has been an attractive topic among economist, geographers and planners for a long time. In growth theories, the neoclassical assumption of growth is criticized by the endogenous growth models. Concordantly, EG models stress that integrating some "endogenous" factors into the growth models is crucial for providing more realistic results and explanations. In a similar vein with Romer, Lucas, Jones, Barro etc., new economic geography (NEG) models (Krugman, 1991) integrated the complex, nonlinear and interactive spatial behaviors and geographical processes into the growth models. Hence, the main message of the NEG models formed around the spatially oriented criticism of neoclassical assumptions of growth.

For a long time economists, geographers and planners more or less ignored the concepts such as distance, space and transportation, and their impact on the growth in regional growth literature. With this regard, does geography matter? And how to explain the mechanisms behind the uneven spatial development are the fundamental questions of NEG (Krugman, 1991).

According to NEG models, agglomeration is the major force behind the growth of an economy. Four mechanisms exist between the economy and the agglomeration. First is the "general equilibrium" which is modeling the entire spatial economy, and the second is "the increasing returns", third is "transport costs", and the last one is the "locational movement of productive factors and consumers" (Krugman, 1991).

Additionally, NEG models suggest that spatial location of an economic activity depends on two factors opposed to each other; these are "centripetal" and "centrifugal" forces (Krugman, 1991).

With this regard, the centrifugal forces are the immobile factors like land rents and pure external diseconomies. Agglomerations, in other words, concentration of economic activities affect both the land prize and land rents. The lands have a disincentive effects for further concentration of activities (Krugman, 1998).

For the "centripetal" forces, Krugman (1998) indicates the forward and backward linkages. Accordingly, a large local market creates both the "backward and forward linkages". Backward linkages provide an accessible and a productive environment for the production of goods where the industries have a tendency to locate, and the economy of scale highly concentrated. Additionally, forward linkages appear in large markets, and provide an economic environment which is prominent with its positive externalities for the production of intermediate goods, and externalities that lowering the costs for the downstream producers. Hence, agglomerations with their spatially concentrated industries provide a "thick local labor market", where employees can find specialized employers and vice versa, and technology and knowledge spillovers (Krugman, 1998).

Core-periphery models

Krugman's (1991) study shows the differentiation process of the industrialized core and agricultural periphery. Krugman (1991) suggests that the emergence of the core-periphery patterns caused by the transportation cost, economies of scale, and the share of manufacturing in national income. The model illustrates how the spatial economic structure response to changes in "increasing returns", "transport costs" and "factor mobility" (Krugman, 1991).

According to Fujita and Krugman (2004) the core periphery model assumes that there are two regions, two main production sectors and also there are two types of labor exist in an economy. The sectors are the agriculture and manufacturing, labor types are the farmers and workers. Differentiated products produced by the manufacturing sector which used the workers as the only input with their mobility. Farmers are immobile and the agriculture sector used them as the only input, and farmers produce "a homogenous good" under constant returns. Both workers and farmers distributed equally between

two regions. The trade of manufactures has a positive effect on the transport cost (Fujita and Krugman, 2004).
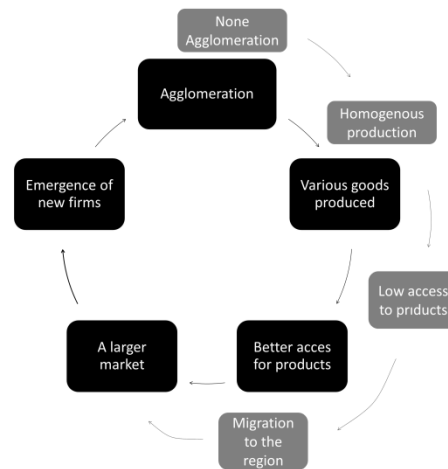
Figure 2.6. Krugman's core-periphery cycle
(Source: Krugman, 1991)

Circular mechanisms appear when the core periphery NEG model investigated watchfully (in Figure 2.6). Various products are produced in an agglomeration which means that, agglomerations provide a better access to workers for achieving these products compared to the regions have no agglomeration, and attract the workers attention. With this regard workers, as consumers, move to the agglomerated region for accessing and benefiting from differentiated goods. This, relocation of the workers towards the agglomeration, leads to expansion of the market and new firms appear, hence, the concentration in an agglomeration will rise (Fujita and Mori, 2005).

Urban and regional systems

Urban and regional systems model is proposed by Fujita and Krugman (1995). According to the model the land is presumed as given and distributed uniformly. Workers are same and they are free to choose their location and occupation. Land and labor are used for production of the agriculture sector. Products from agriculture and manufacturing are affected by the transportation costs positively and the agricultural land is immobile (Fujita and Mori, 2005).

According to Fujita and Krugman (1995) city is defined as the concentration of manufacturing activities surrounded by an agricultural hinterland, and the forward and backward linkages. The interactions across such parts and linkages lead to

reinforcement of the central cities or the central cores, and the economy. Additional city centers and cores emerge (markets) apart, but not far away from such centers (Fujita and Mori, 2005). Then several activities will tend to relocate to these centers due to their spatial and non-spatial externalities (Fujita and Krugman, 2004). With this regard, Fujita and Krugman (1995) suggest that such relocation of the industrial activities lead to development of new agglomerations in accordance with the variety of goods produced in the economy, and/or the low level transportation costs (Fujita and Krugman, 2004).
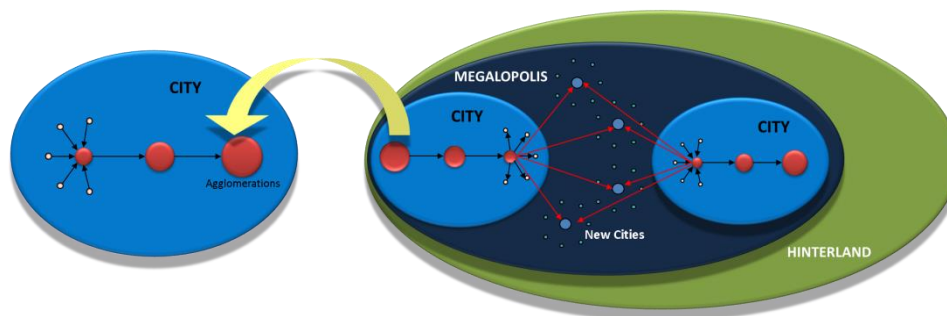
Figure 2.7. An illustration for hierarchical structure among the cities
(Source: Peker and Polat, 2013)

A hierarchical structure among the cities emerges when the industries starts to differ regarding the scale economies and/or transport cost. This hierarchy leads to emergence of a "megalopolis" which consists of large "core cities" as illustrated (in figure 2.7). Transport costs are assumed as the main reasons for the emergence of such hierarchy by the model. Market potentials attract the attention of the firms and the new cities will derive and fill the gaps between the large cities and this process will constitute the formation of the megalopolis (Figure 2.7) (Fujita and Krugman, 2004).

Agglomerations and trade

In, core-periphery, and urban and regional system models, the factor mobility is the key element for the creation of the agglomeration. But in practice, integrating the trade into the NEG model requires reconfiguration of the models regarding the production capacity and diversity of the cities. Besides the basic assumption, the role of factor mobility, the role of specialization of the specific industries and production of specific goods come to the fore due to agglomerations are specialized in a limited range of industries (Krugman and Venables, 1995).

The model stress that, initially, backward and forward linkages have a tendency to concentrate on a single location, where both the upstream and downstream producers are densely located in. Therefore, both the producers (upstream and downstream) of intermediate goods and producers of final goods have a tendency to locate in the largest market where they can easily reach to their suppliers, expose to the increasing returns, transport cost and the other economic externalities of the agglomerations (Krugman and Venables, 1995).
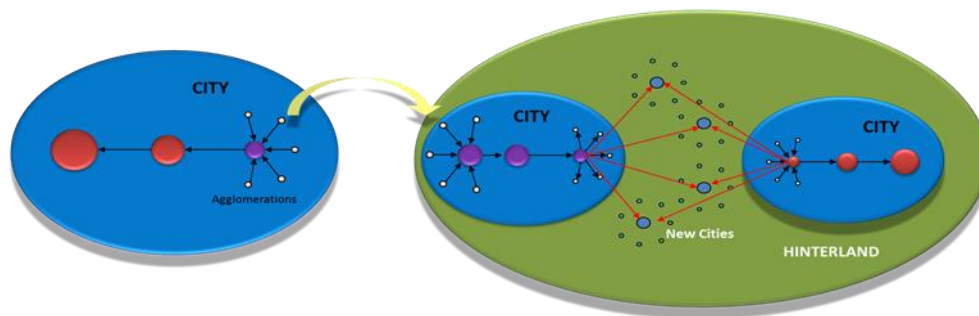
Figure 2.8. An illustration for the industrial concentration for same goods
(Source: Peker and Polat, 2013)

Afterwards, backward and forward linkages will not attract the attention of the new activities due to the concentration of pollution, traffic, and high land prices and labor costs in these locations. With this regard, activities will tend to move away from the concentrated core to the new markets. In other words, the concentration of the activities in a particular area reduces the externalities and market size effects, and increase the costs of concentration which will lead to a relocation of the activities (in Figure 2.8) (Fujita and Krugman, 2004).

2.1.4. Cumulative Causation Theory

Questioning whether the trade encourages growth in both developed and developing economies has a snowball effect on the growth literature. Cumulative Causation Theory (CC), dealing with such issue, suggests that a multi causal mechanism exists in an economy with its core and linkages. The basic idea is that a change in a cycle, surely, will lead to successive changes in such cycle continuously and irrepressibly.

Kaldor (1970), Myrdal (1957), Veblen (1898) and Wicksell progressed the cumulative causation theory with different endogenous component factors. According to the Valben's CC theory, the economic growth is affected by the mechanisms of the institutional change and socio-economic environment. In other words, both the physical and social environments effect themselves circularly and cumulatively (Armstrong and Taylor, 2000).

Kaldor suggests that the growth of a region mostly depends on its scale economies and its benefit from the specialization. The type of specialized productive activity determines the ratio of the benefits. Some activities such as manufacturing activities are more beneficial than the activities such as agriculture or mining regarding the productivity. The specialization in a particular sector and sectorial differentiation in terms of productivity leads to a growth of a region due to the competitive advantage between the regions (Skott and Auerbach, 1995).

The Kaldor's CC model was improved by the study of Dixon and Thirlwall (1975). The model of Dixon and Thirlwall starts with the factors affecting the labor productivity. According to authors any increase in an output will lead to a rise in the level of the technology and the level of per labor capital. These factors affect both the labor productivity, and also the exports price, indirectly. The productivity of the labor will reduce the needs for labor and will lead to production of the same products or goods with less number of labors. Therefore, the costs will decrease and the production will rise. This circular process will never end (Armstrong and Taylor, 2000).

Myrdal's CC model argues that economic development results in a circular causation process leading to rapid development of developed regions while the weaker regions tend to remain behind and the poor countries. With this regard, the model of Myrdal is based on several factors. The first is that it is based on a divergent process which is a typical basic logic of cumulative causation theory. The backwash effect, proposed by Myrdal, explains this basic logic with the increasing economic inequality between the developed and developing countries. The second is, contrary to the first one, it is based on logic of convergence. The third is Myrdal suggest that non-economic factors should be integrated into the analysis. Last one is the political implications (Fujita, 2007).

In Dixon and Thirwall Model (Figure 2.9), a growth in regional output growth will lead to an increase in capital/labor ratio and an improvement in technology. This will cause a rise in labor productivity. Hence, due to the improvement in

competitiveness of the region, the prices of export prices will decrease further. And, this will cause another growth in regional output driven by exports. Thus this cumulative growth process will exists continuously. Overall, CC theory suggest the widening of spatial inequalities, as one region starts growing once, it is then expected to grow cumulatively and giving rise to unbalanced regional incomes.
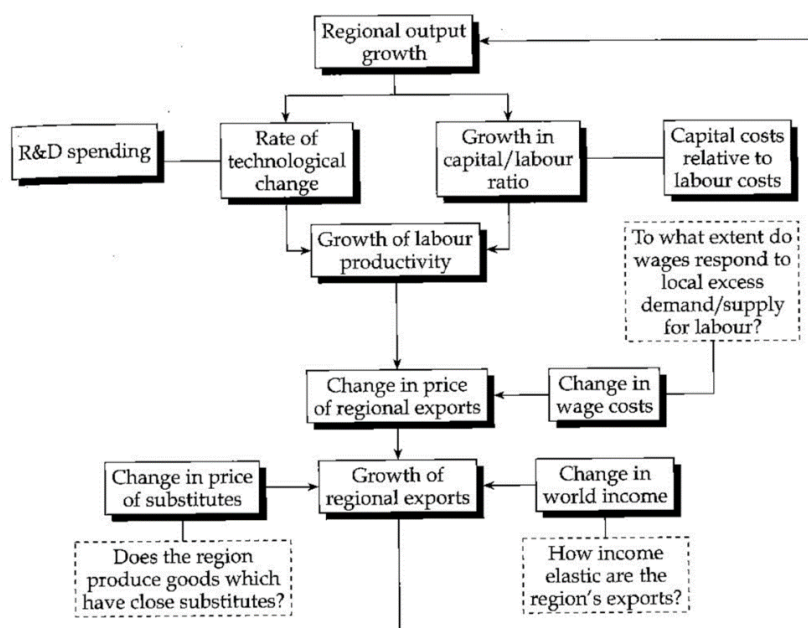
Figure 2.9. An illustration of the Dixon and Thirwall Model
(Source: Armstrong and Taylor, 2000)

Myrdal suggests that the international and interregional economic relations due to its nature leads to unbalanced development, with this regard, in practice weak is always exploited by the strong. According to Myrdal the disparities and backwardness of regions mainly caused by the strong backwash and weak spread effects, the rise in the difference of backwash and spread effects determines the significance of the disparities (Fujita, 2007).

Even the developed region continue to develop with the rate of the underdeveloped region, the increase in the income of the developed region will be more than the increase in the income of the underdeveloped region and this will lead to the regional income differences between the regions. Spread effect continued to become stronger in developed regions while the backwash effect continued to become even

more spread in backward regions. In other words, the cumulative causation cycle is mostly related with the backwash and spread effects (Fujita, 2007).

2.1.5. Growth Pole Theory

Perroux's growth poles theory (1949) mainly based on the idea that the economic growth and development takes place around a specific pole (or cluster) in a region. In other words, the economic growth is not randomly distributed in a region. The pole generally consists of a core industry, which is covered by linked industries mainly benefiting from the direct and indirect effects of such pole (Thomas, 1975).

According to Thomas (1975) the direct effects mean that the core industries are supplied by the upstream linked industries. The downstream linked industries provide goods and services to its customers. The demand for goods and services by the consumers in both the core and the linked industries leads to indirect effect and this indirect effect will progress the development and expansion of the economic activities (Thomas, 1975).

Expansion of the new technologies, new industrial sectors, new investments, outputs and employment are based on the expansion in the core sectors. Growth poles attract the scale and agglomeration economies, and this will lead to an unbalanced regional development pattern. Transportation nodes have a priority and an advantage in this process because this process covers mainly the transportation dependent or related activities. Then, this unbalanced growth pattern leads to the emergence of secondary growth poles with the linked industries and the secondary growth poles contribute to the regional economic diversity.

The growth pole theory is mainly challenged by the emergence of the global supply chains since the growth and the linkages generated by the core industry can easily attract the economic activities located somewhere else. The global supply chains are mainly running with the transportation possibilities yet the technological progress affects the spatial dependency. The spatial dependency gets lighter due to the technological progress of the global supply chains (Buttler, 1975).

2.1.6. Marxist Review

The theories dealing with the growth literature aims at incorporating the spatial concerns into the model since the 1960s in order to make the growth analysis more realistic and more descriptive. This concern attracts the question of "how the economy fits into space" in different periods.

According to Martin and Sunley (1998) the capitalist economy is dominated by two opposing views. The first view is that the neoclassical growth assumes that the gap between the regions (or states) will be disappeared at the steady state with the power of self-correcting mechanism running behind the exogenous growth factors such as capital, labor and wages etc. In other words, neoclassical model is quite optimistic about the regional disparities. Yet, on the other hand, the second view suggests that the neoclassical assumption is not based on a realistic logic and there is no necessary reason to explain why the regional income differences disappear in the long run. Endogenous models suggest that regions have a tendency to diverge rather than converge (Martin and Sunley, 1998).

The Marxist approach assumes that the evolution of the regional inequalities has an "episodic" pattern rather than a prediction of a divergence or convergence. Additionally, the Marxist approach assumes that the economy growing and declining time to time in a dependent manner with the crisis prone nature of the economy. Thus, it is possible to observe regional convergence during one historical phase of regional development and also divergence in another phase (Boschma and Martin, 2007).

2.2. Trade Openness and Growth

Trade theories and its relationship with growth are discussed in this section. We will cover a range of theories starting from the theory of Ricardo to the trade assumptions of the Krugman's new economic geography, and the hypothesis of Myrdal, Krugman, Mansori and Grossman-Helpman.

2.2.1. Trade Openness Concept

Globalization is a process that is never ended and continuously reshaping itself. Neo liberal policies applied all over the world are the major force behind this process. This process leads to a change and transformation of the socio economic and the cultural values like passing beyond the national borders. With this regard, the globalization covers the trade and financial liberalization. In this study the trade openness or trade liberalization are examined and discussed as integration to the international market regarding solely by the trade activities (David, 2007).

Openness or liberalization in trade refers to the integration level of countries to the international trade or market, and the degree to which countries or economies permit or have trade with other countries. Trade openness can also be defined as the removal of the several restrictions on the trade such as tariff and non-tariff obstacles. The removal of such restrictions is promoted by the countries or regions regarding their trade policy (David, 2007).

Trade openness is generally measured by the trade volume to Gross Domestic Product ratio, in other words, the share of trade (export+import) in the GDP. This ratio is often called as trade openness ratio. Besides trade ratio approach, David (2007) divided the openness measures into the six groups. These groups include trade ratios, adjusted trade flows, price based measures, tariffs, non-tariff barriers, and composite indices (David, 2007).

Table 2.1. Methods for the measurement of the trade openness

Measurement	Note	Method
Trade Ratios	The most widely used measure of trade openness	(Exports + Imports) / GDP
Adjusted Trade Flows	Factor proportion model and gravity model, respectively	Regression based approaches and trade flows
Price Based Measures	"exchange rate distortion index and real exchange rate variability index"	Black market exchange rate deviation
Tariffs		Tariff averages
Non-Tariff Barriers	Regional conflicts, historical problems and discrimination	Measurements of trade oriented investments
Composite Indices	World Bank's Outward Orientation Index Sachs and Warner's (1995) index	Various dummies are used for the indexes.

The table is adapted by David (2007).

As mention in Table 2.1, the trade ratio measurement is the most widely used tool. This type measures the size of country or region and their integration to the international markets. The second measurement group is the adjusted trade flows that consist of two methods the factor proportions model and gravity model. The factor proportions models focus on net trade flows while the gravity models focus on the bilateral trade flows. The adjusted trade flows method is not sufficient to measure the effects of the changes in trade policies in a historical context (David, 2007).

Price based measures attempt to capture trade policy by investigating the price distortions in markets. David (2007) claim that the price based measures are in general inadequate to capture the trade restrictions, and openness. Besides that, tariff and non-tariff measures are the popular measures due to the data availability. However, such measures are more advantageous for the determination of the barriers to internationalization of the market (David, 2007).

According to David (2007) measurements based on the composite indices are "subjective". Additionally, "evaluations of trade barriers, structural characteristics, and institutional arrangements" also contains a large degree of subjectivity in these assessments (David, 2007).

2.2.2. International Trade Theories

Countries engage in international trade for two basic reasons, each of which contributes to their gains from trade. First is that countries trade because they are different from each other. Second is that countries trade to achieve the economies of scale for the production. In the basic logic, trade requires an exchange of goods which should mutually profitable. A Sufficient condition for mutual probability is that the imported good of X should be relatively cheaper than the opportunity cost of the production cost of the good X. Thus the differences in relative prices make trade mutually profitable.

The reasons for trade can be sort as, first, the technology and productivity differences between the countries, and second, existence of the different factor endowments of the countries such as the availability of resources temporally or permanently, third, the increasing returns to scale, and lastly, the preferences for variety. The first is related the classical assumption of trade theory. Second is related the

neoclassical trade theory itself and, the third and fourth are related the contemporary new trade theories.

This section tries to develop a theoretical framework understand how differences in international trade theories effect growth and trade patterns.

The Classical (Ricardo-Torrens) Theory

The classical theory of international trade is generally associated with the David Ricardo. The most basic concept in the whole international trade theory literature is "comparative advantage". The comparative advantage states that a country should specialize in producing and exporting those products, in which it has a comparative, or relative cost, advantage compared other countries and should import those goods in which it has a comparative disadvantage.

According to Ricardo, the major variable explaining the existence and pattern of international trade is technology, which is also the main component of the comparative advantage and productivity. Assume two countries A and B and, a good x. And the A produces x at a lower real cost than B. However, if the country A benefits more in importing the x from the country B than producing it by itself, even it is able to produce the x at a lower cost, this indicates the existence of the comparative advantage of A on B (Guandolfo, 2014).

The main messages of the classical Ricardo theory are the importance of technology and win-win situation of the all participants in international trade. The technology is the major factor due to it determines the competitiveness of the cost of the products. Competitiveness is a necessary condition for international trade. Trade is beneficial to all parts because it promotes the competitiveness and the advantage in particular products (Guandolfo, 2014).

The basic assumption of the theory is that the difference between the comparative costs is a necessary condition for international trade to take place. Assume two commodities x and y and assume the unit cost of production of a commodity in two country as x1 and x2 and units costs of other commodity is y1 and y2. When both conditions are met, there will be no difference in the comparison between x1/y1and x2/y2 or between x1/x2 and y1/y2, it will be beneficial to each country to specialize in the production of the commodity in which it has the relatively greater advantage (Guandolfo, 2014).

The absolute and continuous production of Ricardo's model is criticized. Besides that the given technology, due to the low level production or absorption capacity of technologically backward countries; they cannot protect themselves from the competition (Ruffin, 2002).

The Heckscher-Ohlin Model and Trade

The model of Heckscher and Ohlin is built on the Ricardo's theory of comparative advantage by predicting the patterns of commerce and production based on the factor endowments of trading region. The relative densities of the production functions (land, labor, and capital) determine a country's comparative advantage. The basic theorem of the Heckscher-Ohlin is that each country should export the goods which use the country's abundant factors intensively. The availability of the factors of production distinguishes the countries like "capital" abundant country or "labor" abundant country. With this regard, countries should specialize in the production of goods that are further available to production (Guandolfo, 2014). Hence, the basic message is that labor abundant countries should specialize in labor incentive goods, whereas capital abundant countries should specialize in capital incentive countries.

Countries in the production of goods use the relatively abundant factors due to production have a comparative advantage. That is why the price of goods is determined by the prices of the used inputs for the production, ultimately. The production of goods requires the locally abundant production factors is cheaper than the production of goods requires locally scarce production factors (Guandolfo, 2014).
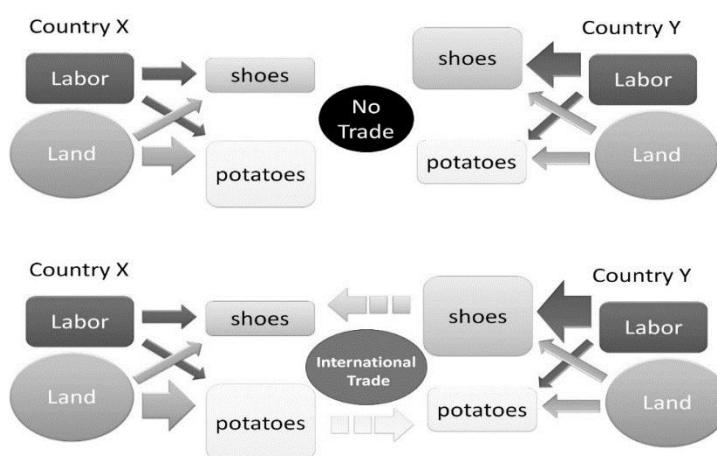
Figure 2.10. An illustration for Heckscher-Ohlin Model and trade
(Source: Guandolfo, 2014)

This model stresses the differences in factor endowments as the cause of international trade and specialization. More precisely, the key element in the theory is that countries are endowed with factors in different proportions. This gives rise to different relative marginal cost of production and will make that each country should exports the goods, which they are able to use the abundant factors they have for the production of such good, intensively (Guandolfo, 2014).

The figure 2.10 illustrates the Heckscher-Ohlin Model of trade in which country X and Y produces two goods potatoes and shoes prior to free trade. But once they open up to international trade, each country specializes in the good which the sources are more available and country X exports potatoes and as an exchange Y sells shoes to X. In the end both country are better off since they specialize and increase their productivity (Guandolfo, 2014).

2.2.3. Trade Openness, Regional Inequalities and Growth

Theoretically, the relations between the trade openness and the regional inequality are the topic that remains unsolved. However, there are some attempts existing in the literature to integrate the trade liberalization into the growth models (Myrdal 1971, Grossman and Helpman 1990, Findlay 1995, Krugman and Livas Elizondo 1996, Puga 1999, Mansori 2003, Connolly 2003, etc.). Besides that, the empirical studies indicate conflicting results.

There are actually two main hypotheses exist in the literature; the optimistic one suggests a homogenization of prosperity under trade liberalization and the pessimistic one suggests a widening of the inequalities. A brief account of the reasoning for each is provided below.

To start with the optimistic one, a class of NEG models argue that trade liberalization is likely to be contributing to the reduction of disparities (Krugman and Elizondo 1996). According to this claim, as a country opens its markets to trade, core regions tend to become less attractive for firms (Ozyurt and Daumal 2011). Since land costs, internal competition, congestion and labor costs are high in large metropolitan areas, advantages created by locational concentration cannot exceed these costs (Ozyurt and Daumal 2011). Hence, firms prefer to relocate and move towards the peripheral regions in search of a higher profit margin and finer economic climate (Fan and Casetti

1994, Rodriquez-Pose and Gill 2006). Such a diffusion process is likely to foster the economic growth in backward regions and contribute to the reduction of income disparities (Krugman and Elizondo, 1996).

Table 2.2. The effects of increased trade openness with the endogenous factors on the regional inequality

Authors	Agglomeration	Infrastructure	Closeness Border	Foreign competition	Human Capital	Natural Resources	Labor Mobility	Technology Diffusions
Myrdal 1971	▲	▲			▲			▲
Handerson 1982 Rauch 1991	▲		▲					
Grossman and Helpman 1990	▲				▲			▼
Findlay 1995						▲		
Krugman and Livas Elizondo1 996	▼							
Allonso and Villar 1999	▲			▲				
Puga 1999							▼	
Mansori 2003		▲						
Connolly 2003					▲			▲

The table is developed from Gonzales-Rivas (2008) and the author's own assessment. ▲ means increased impact, ▼ means decreased impact of trade openness on regional disparities.

On the other hand, another group of scholars adopt a pessimistic view by arguing that trade liberalization provides additional benefits to developed regions (Rivas 2007; Myrdal 1957, Crozet and Koenig 2004). The rationale behind this claim is attributed to the advantages of agglomeration and centripetal effects of trade openness (in accordance with Myrdal (1957)). Such that, developed regions which have low cost access to foreign markets, competitive advantages and highly mobile work force benefits the increasing returns to scale created by agglomeration. Indeed, during the liberalization process firms tend to move towards the metropolitan areas which promote

the cumulative growth process. In contrast, peripheral places can hardly benefit this ever-growing process. Thus, inequalities between rich and poor regions tend to widen over time (Henderson and Kuncoro 1996, Aghion et al. 2004). In detail, one can find in Table 2.2 detailed documentation of the channels through which trade can influence the inequalities.

Almost all authors agree on the fact that agglomeration of economic activities will induce the economic polarization and increase the inequalities. It follows the same logic as explained previously; opening up to the markets to trade will make the central locations very attractive since they are close to the market and labor pool. Then, the flow of firms and capital towards the already developed areas unfavor the backward regions, and lead to an increase in regional disparities.

In addition to such main and contradicting hypotheses of Krugman and Elizondo (1996), and Myrdal (1957), concordantly, there are also several attempts existing in the literature that these studies try to explain the effects of trade openness on regional inequalities by focusing on additional factors. Such factors are the effects of agglomerations, infrastructure, closeness to the borders or market, the effects of foreign competition, human capital, and closeness to the natural resources, labor mobility, and technological diffusion.

The table apparently shows that the effects of trade on regional disparities are either in accordance with the optimistic Krugman and Elizondo (1996) or the pessimistic Myrdal (1957). Except Puga (1999), the rest of the studies suggest the main finding of Myrdal (1957) that further trade leads to unbalanced regional development, whereas, Puga (1999) is in a same line with the Krugman and Elizondo (1996).

Starting with the pessimists, Handerson (1982) suggests that closeness to the borders fosters the growth due to the lower trade costs. Grossman and Helpman (1990) and Connolly (2003) stress the role of technology diffusions, and suggest that regions that have higher level of human capital absorb and benefit from the technology diffusions arises from the openness more. Mansori (2003) claims that transportation investments lead to acceleration in the growth and the expansion of the concentrated larger cities. Findlay (1995) suggests that closeness to the natural resources determines the growth speed of the regions. With these regard, all these factors lead to an unbalanced development, and an increase in the regional disparities in a line with the hypothesis of the Myrdal (1957).

As for the optimistic, Puga (1999) stresses the role of labor mobility due to the wage differentials across regions. Puga (1999) claims that opening up to trade reduces the trade costs due to the reduction of the trade barriers, tariffs, and quotas etc. Also, it reduces the attractiveness of the more industrialized regions from the eye of labors regarding their externalities and differing wages level. These loses in attractiveness leads to dispersion of the industry from core to the periphery and help consequently development of poorer regions.

2.3. Regional Convergence Debate

Whether incomes are converging across the economies or regions is the question that has a snowball effect in the literature since the 1930s, therefore a quite number of scientists have tried to answer, yet, there is no clear answer (Margini, 2004). For a detailed account of information about the convergence debate, this part devoted to the both theoretical and empirical frameworks of the convergence literature.

2.3.1. Convergence Types

There are four known types of convergence, namely the σ convergence, absolute (unconditional) β convergence, conditional β convergence and club convergence. σ convergence occurs if the dispersion of income per capita across countries declines overtime. On the other hand, β–convergence occurs if the countries converging to their own steady state of growth rate in the long run. β-convergence concept is divided into two sub-groups, absolute and conditional convergence, for the analyses of different types of steady states (İslam, 2003).

Absolute β-convergence

Absolute convergence, in other words, unconditional β-convergence can be expected in the case of all economies share the same technological level, homogenous economic system and institutional environment (Margini, 2004).

Absolute β convergence suggests a tendency towards the equalization of per capita incomes. It has an inverse relationship between the income growth rate and its initial level. Absolute β convergence considers the assumption of the high growth rates

of the poor countries against the rich countries, regardless of the determinant of growth of the sample countries. Unlike conditional β convergence, poor countries will grow faster than rich ones in order to catch up with the rich ones. Absolute β convergence means that both poor and rich countries will converge to the same level of per capita income in the steady state (Margini, 2004).

Conditional β -Convergence

If the economies differ in technological level, economic system and institutional environment, thus they share the different steady states, and conditional β-convergence can be expected and the model requires various additional explanatory variables in order to represent proxies for the different steady states (Magrini, 2004). Regional economies will not converge to a common steady state but to their own long term steady state equilibrium. For testing the conditional β- convergence additional explanatory variables should be incorporated into the models (Sala-i-Martin 1996, Margini 2004).

σ-convergence

According to Magrini (2004), σ-convergence analyzes "the dispersion of income at a given moment in time". If the dispersion (measured by the coefficient of variation) of per capita income among economies falls over time, the σ-convergence will be occurred (Margini, 2004). σ convergence refers to a reduction in the cross–sectional variance of income per capita among the countries (Sala-i-Martin, 1996).

Club convergence

The Club convergence concept is introduced to the literature by Baumol (1986) and suggests that there is no global convergence pattern exists for all countries. The club convergence is that the countries or regions with similar structural characteristics, initial conditions and technology levels will converge to one another. Similar characteristics, initial conditions and technological levels will determine the convergence clubs that the regions will converge. Absolute convergence assumes a steady state, and all economies will converge to same steady state, conditional converge assumes a distinguished steady states. In other words, each economy has its own unique steady states, besides that, the club convergence based on the models that assumes mutli-steady states (Sala-i-Martin 1996, Margini 2004).

2.3.2. Methods of Convergence Analysis

Approaches of convergence analysis are summarized by Magrini (2004) under two groups. The first is the regression approach mainly consist of the cross sectional regressions, panel regressions and the time series methods. The second one is the distributional approach. Due to it is beyond the scope of this thesis and the lack of place, the distributional approach is not addressed.

Cross Sectional Method

In economics, the cross-sectional regression is a type of a regression in which the explained and explanatory variables are associated with one prior or point in time. The cross-sectional method of convergence analysis is introduced to the economic growth literature by Baumol (1986) and then progressed by Barro and Sala-i-Martin (1991, 1992).

Typical cross-sectional β- convergence is introduced by Barro and Sala-i-Martin (1992). The model relies on the following function Barro and Sala-i-Martin (1992):

$$\log\left(\frac{y_{i,t}}{y_{i,t-1}}\right) = \alpha_i - \left(1 - e^{-\beta}\right)^i \left\{\log(y_{i,t-1}) - x_{i,t-1}\right\} + {}_{i,t} \qquad (5)$$

where dependent variable shows the income growth of regions, whereas independent variable is the initial income level of regions. Then, β shows whether convergence takes place.

There are a great number of studies existing in the literature that some of them analyze the countries across the world and some specifically focus on the Europe countries and regions. Most of the studies reveal conditional β- convergence which is around 2 percent per year (Magrini, 2004).

Magrini (2004) criticizes the cross-sectional approach regarding two factors. The first one is that the cross-sectional method is limited and poor for distinguishing the various growth theories when they are incorporated into the analysis. For instance, the analysis of neoclassical assumption of growth is linear, whereas it is nonlinear for the endogenous growth models and this difference leads to inability for discriminating such models.

The second is, mostly, related the uninformative and vulnerability of the cross-sectional regressions regarding misleading outputs. Magrini (2004) suggest that the contribution of the conditioning explanatory variable is quite important. This importance comes from its ability to affect the results, growth rate and the significance of the factors (Magrini, 2004).

Panel Method

Panel data often refers to a dataset where the observations are dominated by large numbers of cross sectional units (i), and time periods (t). This can be generated by pooling time-series observations across a variety of cross-sectional units including countries, states, regions, firms, or randomly sampled individuals or households (Baltagi, 2008).

According to Baltagi (2008) the benefits of the panel approach can be collected under two groups. The first benefit is that the panel data refers to the repetition of the cross sectional variables in a particular time period which provides both the variety of variables and less collinearity, in other words, the regression yields more reliable estimates (Baltagi, 2008).

Another advantage of the panel datasets is related to their ability to control the individual heterogeneity. Balgati notes that panel data sets are better for studying, identifying and estimating the complex dynamic behaviors compared to the cross-sectional and time-series data sets (Baltagi, 2008).

Time Series Method

Time series data refers to the data that is collected on the same observational unit at multiple time periods and also a sequence of observations on some phenomenon observed at regular intervals. Times series method has a natural date ordering, that is a calendar time at some periodic frequency. A dataset that consists of the variables are dated at a same point in time (Ostrom, 1990).

A collection of the data with the intervals gives possibilities to investigate how variables behaved in the past and how they are likely to be in the future. The most important feature of the times series method is the possibility for both explaining the past and predicting the future behavior (Ostrom, 1990).

CHAPTER 3

EMPIRICAL CONVERGENCE AND TRADE OPENNESS LITERATURE

The current chapter is devoted to summarizing the empirical studies. The regional convergence literature in world is summarized in section 3.1, and the relationship between trade openness and convergence in the world in section 3.2. We provide literature summary on the regional growth of Turkey in 3.3. And, in 3.4 we provide a literature summary of empirical investigations on regional convergence and the relationship between trade openness and inequalities in the Turkey. The evolution of the Turkish economy, the historical background regarding the implemented growth policies, the liberalization process and its evolution summarized in section 3.5.

3.1. Empirical Convergence Literature

Whether incomes are converging/or diverging regarding regional disparities is an interesting topic for the scientists. A great number of empirical studies connected with the regional convergence research exist in literature. Initially most of the earlier studies concentrated on the whether the incomes of countries converge or diverge. Then the convergence literature tended to investigate regional level (sub national units) inequalities in a country or multiple countries (Magrini, 2004). Nowadays, studies are covering various spatial levels such as some studies dealing with the regional disparities at cross-country (the international) (Pritcett, 1997), national (Barro and Sala-i-Martin, 1992), state (Carlino and Mills, 1996), regional (Krugman and Venables, 1995) levels.

Considering the scope and diversity of the convergence literature, we examined the regional convergence literature according to their space both in national and regional levels. Table 3.1 provides an overview for that purpose, mostly the studies implemented at the cross country level.

The "seminal" studies of Baumol (1986), Barro and Sala-i Martin (1991) and Mankiw et al. (1992), introduced the convergence in per capita income across or within the countries. And this caused to the emergence of the one of the most significant issues

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in empirical economics. Afterwards, a large number of studies tried to understand whether there is a convergence among or within countries. Two main concepts of convergence, β-convergence (unconditional or conditional) and σ-convergence have been used in the literature.

In his seminal study, the neoclassical prediction of convergence is tested by Baumol (1986). Baumol found a negative value of β coefficient. And interpreted it as, the low level per capita economies have the higher growth tendencies like the neoclassical growth theory supports (Solow, 1957).

Barro and Sala-i-Martin (1994) involved the fact of differentiated level of steady state of economies into the discussion, they support that, as neo classical model stresses, poor economies can catch up the richer economies, solely, in the case of they all share the same steady state, and if the economies have different level of technology and saving behaviors, that means these economies have different steady states, and the gap between poor and rich economies will never close.

Caselli et al. (1996) maintained the convergence debate by examining cross-country growth. Their study reveals that per capita incomes converge to their steady states at a rate almost %10 percent per year contrary to the outputs of Sala-i-Martin (1996) who indicates a %2 convergence pattern across the countries. Caselli et al. (1996) criticize and challenges the "status quo" of convergence literature, and evaluate the existing consensus of %2 growth per year as "unrealistic".

Barro (1997) contributed to the convergence literature by examining the convergence process with some explanatory variables such as democracy types, education, life expectancy, government consumption etc. The study reveals that countries convergence conditionally.

Pritchett (1997) studies the growth pattern of counties regarding the two set of countries, developed and developing. The study suggests the existence of the divergence pattern among the two sets of countries. The developed countries converge to themselves and grow faster than the developing countries, and the gap increased. According to the Pritchett (1997) the growth pattern of the developing countries is various. Some of the developing countries converging rapidly to the leaders, on the other hand others stagnant.

David (1997) reveals the existence of the club convergence pattern. The study suggests that income gaps have increased within most of countries and the convergence

clubs are located at the end of the both income spectrums. The highest convergence clubs arise among the world's very poorest countries.

Table 3.1. Summary of empirical convergence literature

Authors	Sample	Variables	Method	Results
Baumol 1986	▪ 1870-1979 ▪ 16 Maddison's Countries	▪ GDP per work hour ▪ GDP per capita ▪ Export	▪ Cross-sectional regression	▪ Slow convergence pattern exists across the countries
Sala-i-Martin 1996	▪ 1960-1990 ▪ 110 OECD Countries	▪ GDP per capita	▪ Cross-sectional regression	▪ Strong evidence of conditional divergence and conditional convergence but the speed is almost %2 per year which is quite slow.
Caselli, Esquivel and Lefort 1996	▪ 1870-1979 ▪ 16 Maddison's Countries	▪ GDP	▪ Panel regression	▪ Per capita incomes converge to their steady-state levels at a rate of approximately 10 percent per year.
Andres, Domenech and Molinas 1996	▪ 1960-1991 ▪ OECD countries	▪ GDP ▪ Physical and human capital	▪ Cross-section regression	▪ Macroeconomic performance indicators have considerable explanatory power in growth regressions for OECD countries.
Barro 1997	▪ 1960-1990 ▪ 100 Countries	▪ GDP ▪ Trade	▪ Cross-sectional regression	▪ There is a pattern of conditional convergence exist among the countries.
Pritchett 1997	▪ 1870-1990 ▪ OECD countries	▪ GDP per capita	▪ Time series	▪ Average gap in incomes of all countries from the leader had grown by an order of magnitude.
David 1997	▪ 1960-1985 ▪ 113 countries	▪ GDP per capita	▪ Time series	▪ Income gaps have increased within most possible groupings of countries in the world.
Kocenda 2001	▪ 1991-1998 ▪ 11 transition countries	▪ GDP	▪ Time series	▪ Countries converging. The highest level of convergence is achieved in growth rates of real output.
de la Fuente 2000	▪ 1950-1990 ▪ 98 OECD countries	▪ GDP per capita	▪ Panel regression	▪ Reports beta convergence pattern across the most of the regions.
Nahar and Indeer 2002	▪ 1950-1998 ▪ 22 OECD countries	▪ GDP per capita	▪ Log of Real per capita GDP	▪ Convergence among this group of OECD countries between 1950 and 1998 is quite strong.
Mazumdar 2002	▪ 1960-1995 ▪ 91 countries	▪ GDP per capita	▪ Cross-sectional regression	▪ Divergence for all the cases implying that the economies of the world are becoming more dissimilar.
Garofalo and Yamarik 2002	▪ 1977-1996 ▪ OECD countries	▪ GDP ▪ Capital stock ▪ Gross investment	▪ Time series	▪ The study finds a %2 convergence pattern that is confirming the outputs of Barro and Sala-i-Martin.

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Table 3.1. (cont.)

Petrakos and Pose 2005	▪ 1960-2000 ▪ EU countries	▪ GDP ▪ Population weighted GDP	▪ Panel regression	▪ Disparities have a periodic pattern in the short term in EU level. ▪ Disparities have an increasing during the expansion periods while it is decreasing in the low growth
Madsen 2007	▪ 1870-2004 ▪ 16 OECD countries	▪ GDP ▪ Human capital	▪ Cross-section and time series analyses	▪ The technology spillovers strongly effect the growth performance.
Duasa 2008	▪ 1970-2004 ▪ OIC countries	▪ GDP per capita	▪ Linearity test	▪ Countries which ranked higher in term of globalization economically and technologically are also those that experience income divergence.
Pastor, Pons and Serrano 2010	▪ 1975-1990 ▪ OECD countries	▪ GDP ▪ Labor productivity	▪ Output-based productivity index	▪ Technical change has worked against labor productivity convergence, since it has always been greater in the countries with higher labor productivity.

The table is created by author's own assessment.

The study of the Kocenda (2001) focuses on the convergence performance of the central and eastern European transition economies. The study suggests that common institutional attributes and economic policies tend to correlate with a higher degree of convergence which is in accordance with the assumption of NC theory that stresses the existence of the convergence pattern across the similar countries.

de la Fuente (2000) contributed to the convergence literature by criticizing the neoclassical growth models as dissatisfying regarding the existing consensus on the determinants of the growth. The critic is that the neoclassical models are unable to account the key features and the lack of capital flows. In his study, de la Fuente (2000) reports evidence of the long run convergence tendencies both across the countries and across the regions.

The study of Nahar and Indeer (2002) introduces a new testing procedure to the literature for convergence analysis. The study reveals the existence of the absolute convergence for the majority of tested countries.

The study of Garofalo and Yamarik (2002) verified the results of the study of Barro and Sala-i-Martin which indicate a convergence rate about %2 across the countries. Petrakos et al. (2005) test the two hypotheses of Solow's neo classical growth model and Myrdal's cumulative causation theory, and the study reveals that both short-

term divergence and long-term convergence processes coexist. The study reports a periodic pattern which consists of two phase, the first is, dynamic and developed regions grow faster in periods of expansion, and the second is, such regions grow slower in periods of recession.

Duasa (2008) examined the ten Organization of Islamic Conference member countries regarding the evolution of the regional disparities. The main finding of the study is that most of the countries experience income divergence. Dausa (2008) integrated the globalization process into his model and reports the existence of the divergence patterns across the economies, outputs in a similar vein with the endogenous assumption of growth.

Mazumdar (2002) measures the standards of living using a human development index. The author suggests that the human development index yields better outputs than the income or productivity regarding the human well-being. The study uses the convergence test introduced by Baumol (1990). The tests indicate the existence of the divergence pattern across the 91 countries.

The lack of consensus in the convergence literature also exists for the regional level empirical studies which we are documented and summarized in Table 3.2.

The tendency of regional level analyses in the convergence literature is not quite old. Terrasi (1999) analyzed the Italian regions between 1953 and 1993 by using a cross-sectional method. First, the study reports the existence of the strong convergence, and then the divergence patterns across the Italian regions.

Lall and Yılmaz (2001) examine the relationship between the public capital, regional output and private sector productivity and the convergence among US regions between 1960 and 1990. The study shows that the speed of convergence is influenced by region specific characteristics and the availability of trained labors in neighbor regions.

Carvalho and Harvey (2002) examined the eight US regions between 1950 and 2000 by using a times series model. The study reports that all regions are converging except the two richest regions; such richest regions are diverging. Badinger et al. (2003) estimate the speed of income convergence for a sample of 196 European NUTS 2 regions for the period between 1985 and 1999. The study estimates 7 percent convergence speed across regions by using a spatial dynamic panel analysis.

The study of Ertur et al. (2006) examined the regional convergence and the effects of spatial dependence across the 138 European regions between the 1980 and

1995. The study reveals that the convergence process is differing regarding the regimes. The study also reports the existence of the robust significant spatial spillover effect. A growth in average income of a region has an impact on the growth rate of neighboring regions, positively.

Table 3.2. Summary of regional level empirical convergence literature

Authors	Sample	Variables	Method	Results
Terrasi 1999	▪ 1953-1993 ▪ Italian regions	▪ GDP per capita	▪ Cross-sectional regression	▪ A strong convergence term between 1960 1975 and then a divergence are detected.
Lall and Yilmaz 2001	▪ 1960-1990 ▪ US regions	▪ GDP per capita ▪ Public capital ▪ Human capital	▪ Panel regression	▪ Finds conditional convergence and the convergence of a region mostly related with its characteristics and human capital.
Carvalho and Harvey 2002	▪ 1950-2000 ▪ US regions	▪ GDP per capita	▪ Time series	▪ All but the two richest regions have displayed (absolute) convergence over the last 50 years.
Badinger, Müller and Tondl 2003	▪ 1985-1999 ▪ EU regions	▪ GDP per capita ▪ Technology level ▪ Spatial dependence	▪ Panel regression	▪ Very high level spatial autocorrelation and a convergence across the regions about %7.
Ertur, J Le Gallo and Baumont 2006	▪ 1980-1995 ▪ European Regions	▪ GDP ▪ Regime types	▪ Panel regression	▪ The convergence patterns varying according to the regime types.
Dall'Erba and J Le Gallo 2008	▪ 1989-1999 ▪ 145 European regions	▪ GDP per capita ▪ Investments ▪ Population	▪ Panel regression	▪ Convergence takes place, but that the funds have no impact on it.
Artelaris Kallioras and Petrakos 2010	▪ 1990-2005 ▪ European Regions	▪ GDP per capita	▪ Coefficient of Variation	▪ There are some convergence clubs exist in Europe.
Bartkowska and Rield 2012	▪ 1990-2002 ▪ 206 European regions	▪ Human capital ▪ Labor force ▪ Population growth	▪ Panel regression	▪ Study reveals the existence of six convergence clubs in terms of per capita income across European NUTS2 regions.
Chen and He 2014	▪ 1995 – 2010 ▪ 26 regions	▪ Population growth ▪ Investment ▪ Human capital	▪ Panel regression	▪ Higher road tolls impede inter-regional trade and thus lead to greater market segmentation.
Rattso and Stokke 2013	▪ 1972-2008 ▪ 89 Norwegian regions	▪ GDP ▪ Population	▪ Panel regression	▪ The large city-regions have highest population growth rate. They are expanding based on both domestic and international in-migration.

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Table 3.2. (cont.)

Holmes, Otero and Panagiotidis 2013	▪ 1929 2009 ▪ 48 US regions	▪ GDP	▪ Time series	▪ Real per capita income converges.
Jiang, Liu and Su 2014	▪ 2000- 2011 ▪ 14Coastal Chinese regions	▪ Population ▪ GDP per capita ▪ Unemploymen t rate ▪ Marine labor	▪ Panel regression	▪ The marine economy contribute the growth of coastal regions and this lead to unbalanced regional development.
Evans and Kim 2014	▪ 1985 – 2011 ▪ 13 Korean regions	▪ Physical capital ▪ Technology level	▪ Panel regression	▪ There is a positive spillover effect of growth among Korean regions

The table is created by author's own assessment.

Dall'Erba and J Le Gallo (2008) evaluates the impact of structural funds on the convergence process across the 145 European regions over 1989–1999. The spillover effect is investigated with spatial econometric methods. The results of the study indicate that significant convergence takes place, but, the funds by EU don't have any impact on such convergence pattern. Additionally, the study reveals that simulation experiments show the investments targeted to the peripheral regions never spill over to their neighbors regions.

Artelaris et al. (2010) examined the level and the evolution of regional inequalities across the new EU member states, and the possibility of the emergence of regional convergence clubs. The nonlinear econometric models are applied in this study, and the study reports the existence of regional convergence clubs among new EU member states.

Bartkowska and Rield (2012) aims at investigating the convergence clubs in per capita incomes across the 206 European NUTS II between 1990 and 2002, and also investigates whether the initial conditions are responsible for the formation of the convergence club. The results indicate the existence of convergence clubs across the regions of EU. Besides that according to the study, six clubs consisting of European regions are differing regarding their convergence patterns and the formation of such convergence clubs mostly depends on the human capital and per capita income level of the regions.

Chen and He (2014) investigate the effect of infrastructure on regional growth across the 26 regions of China between 1995 and 2010 using a pooled panel method.

The study reveals that further transportation fees may contribute to financing local transportation networks, but they hinder the inter-regional trade, thus further market segmentation leads to an increase in the regional disparities.

Evans and Kim (2014) investigate the effects of technological spillover and spatial interdependence on regional inequality across the 13 regions between 1985 and 2011. And the study reveals that a positive spillover effect of growth exist across the Korean regions and the convergence speed is faster in the spatial lag model than the model without spatial interdependence.

As a start with the cross country convergence literature, it is clear that studies differing regarding their results and scope. Obviously, two main streams appear the convergence and divergence trends. In the empirical cross country convergence literature some studies reporting a decreasing trend across the countries which mean the gaps across the countries decrease and convergence. On the other hand some studies report divergence trend across the countries, the disparities are increasing (Dausa 2008, Mazumdar 2002).

Additionally, convergence reporting studies are also differing regarding the types of convergence they report. Some of such studies confirm the results of Baumol (1986), Barro and Sala-i-Martin (1994) that they reporting an absolute convergence trend (Caselli at al.1996, Kocenda 2001, de la Fuente 2000, Garafolo and Yamarik 2002). Some report conditional convergence, which means countries have different levels convergence speeds (David 1997, Barro 1997).Besides that there are also studies exit in the literature that they report periodic pattern which means countries diverge and/or diverge in various terms like long term and short term (Petrakos et al. 2005).

Regional level studies are also differing regarding their results in a similar vein with the empirical cross country convergence studies. Some studies suggest report conditional (Lall and Yılmaz 2001, Carvalho and Harvey 2002, Ertur et al. 2006) and some report absolute convergence (Badinger et al. 2003, Dall'Erba and J Le Gallo 2008). And some report periodic pattern (Terassi 1999). More specifically, in regional level convergence studies, some studies even they focus on the same regions in a same period can report different results which indicate lack of consensus is deeper in the regional convergence literature.

In empirical convergence literature, studies also test the impact of the factors like the democracy types of countries, level of economy like developing or developed, the education level, human capital and labor productivity of the countries etc. on the

growth patterns, and the variety of these factors affect the scope of the studies and such variety has a significant impact on the lack of consensus on the convergence debate.

We summarized the empirical trade openness and regional growth literature in next part.

3.2. Empirical Trade Openness and Convergence Literature

The empirical trade openness and regional convergence literature is summarized in this part. Whether further and open trade foster or diminish the speed of regional income convergence has been discussed since the beginning of the 1990s. There are several studies exist in the literature that they are focusing on separately both on the regions of developed and developing counties. Besides that, there are also several studies exist which aim at measuring the impact of trade on the cross-country disparities.

In table 3.3., we summarize the literature that focused on the trade openness and regional convergence. Both the studies focus on the developing countries such as Mexico, Brazil, Argentina, India, China and Philippines etc., and the studies covering the developed countries like Canada, Austria and Germany and also the studies based on the cross-country studies are documented. The results reveal that trade openness affects the regional income inequalities in different ways (positive and negative). Therefore, we examined the studies in order to analyze and determine the factors that lead to different level of responses of the countries to the trade openness.

To start with, Hanson (1998) investigates the regional adjustments of the Mexican economy to the trade liberalization process regarding the transport costs, backward–forward linkages, and agglomeration economies. The study reports that trade liberalization leads to formation of the new industry centers, especially, in the northern Mexico which is away from the manufacturing belt of the Mexico City. The employment increased in the industries that are close to the United States after trade liberalization process is started. It means that industries have a location choice due to the upstream and downstream industries which are affected mostly by the transport costs.

Pernia and Quising (2003) analyzed the trade openness and the regional development in Philippines between 1988 and 2000. Trade openness leads to more

development in less developed regions than in developed regions. Unfortunately, the development in less developed regions still could not balance the regional income inequalities across the regions of Philippines.

Chiquiar (2005) studies the trade liberalization and regional wage inequalities in Mexico between 1970 and 2001. Regional wage inequalities display a decreasing pattern until the integration of the Mexico to the NAFTA agreement. Then, regions that are close to the US border became increasingly important due to the market access and wages in these regions increased. Therefore, trade liberalization leads to spatial divergence across the regions of Mexico, inevitably.

Kanbur and Zhang (2005) investigated the trade liberalization process and its effect on regional disparities between 1952 and 2000. Authors measured the regional inequalities in China by using Gini and General Entropy models in Rural-Urban and Inland-Coastland divisions. Both the Gini and General Entropy models yields an increasing pattern in China both in Rural and Urban, Inland and Coastland divisions. The main reason behind this process is that trade liberalization process, which mostly started after China joining to the WTO, fosters the regional income inequalities across the regions of China, especially, between inland and coastland. With this regard, it is not wrong to suggest that, government policies foster the regional income inequalities between the inland and coastland of China.

Rodriguez-Pose and Sanchez-Reaza (2005) studied the trade openness and regional growth in Mexico between 1980 and 2000. The study indicates a severe regional income divergence across the regions of Mexico. The main reason is that when NAFTA fosters the development of the regions that are close to the US borders, the city core, Mexico City also restructured itself as a financial center at the same time. And, so, the development in the regions that are closed to the US border is not sufficient for balancing the regional inequalities due to the fact that high value added services are agglomerated in the city core.

Faber (2007) analyzed the economic polarization derived from the trade liberalization policies and regional growth in Mexico between 1993 and 2003. Different from the other studies, the study of Faber (2007) discussed that the effects of trade openness on regional income inequality within the scope that such effects depends on several factors besides the trade volume and characteristics of the regions, etc. Especially this study distinguish itself from other studies by approaching closeness to the market concept as closeness to the export based international market and import

based internal market. Besides, the study tests the effect of trade openness on regional income disparities by focusing on these differentiated markets one by one. The study reports that export based industries grow more in border regions; while the import based industries grow more in the interior regions at the same time.

Gonzales Rivas (2007) investigated the regional income disparities in Mexico between 1940 and 2000. More specifically, the study investigated how the regional disparities are evolved by the Mexican trade liberalization policies. The study reports that trade liberalization, let's say opening up to trade, leads to a further growth in the richer regions. In other words, trade liberalization fosters the growth of the regions that have high level of income. Besides that it also fosters the growth of the regions that they have better infrastructure, additionally and surprisingly, more trade also leads to a further growth in the regions that they have low level of education. The first two, indicate an increasing pattern regarding regional disparities, while the latter has a decreasing effect. However, the study reveals that the latter effect is lower than the former, so the overall effect of trade liberalization has a positive impact on the regional disparities in Mexico.

Redding and Sturm (2008) test the effects of unification of the West and East Germany on the regional income disparities across the regions of Germany by considering such unification as a policy aims the removal of the barriers against trade. According to the study, before the division the East and the West of the Germany almost have the same level of income, and, during the East and West division the cities closer to the border lost their population and employment, so, the remoteness have a negative impact on the regional income disparities in Germany. The unification of the East and West Germany leads to growth in the cities that are closer to the border, which means a decrease in overall inequalities.

Chiquar (2008) analyzed the effects of trade openness on wage differentials between 1990 and 2000 in Mexican regions. The study of Chiquar (2008) criticizes the literature by stressing the importance of the spatial dimension of the trade openness and the study suggests that spatial dimensions generally neglected by the literature. With this regard, the study reports that the regions that further exposed to globalization are able to increase their overall wage levels, yet they are also able to reduce their productivity, so the study suggest that the effects of the trade openness on regional inequality depends on several factors like productivity and the openness level etc.

Sanguinetti and Martincus (2009) focused on the Argentina which includes a giant city Buenos Aires like Istanbul in Turkey. The Authors suggest that the economic investments and activities are concentrated around the Buenos Aires. As Krugman (1997) indicates, the tariffs, congestion costs, communication costs, high land rents and taxes lead to dispersion of the economic activities from city cores to the periphery and low industrialized centers. With this regard, authors report that trade policy of Argentina has a significant effect on the location choice of the manufacturing and other economic activities. Therefore trade liberalization process causes a decrease across the regional inequalities in Argentina.

Brulhart et al. (2010) investigated the effects of trade openness on wages and employment in Austria between 1975 and 2002. Brulhart et al. (2010) suggest that, after 1990, the fall of the Iron Wall leads to more liberalized trade of Austria with its neighbors. In similar vein, the study attempted to investigate how the fall of the Iron Wall affects the interior and border regions of Austria in terms of regional disparities. The study reports that the effects of trade liberalization on employment and wages are statistically significant and positive in the regions that are not far away from the border (within 25 km); the effect of trade openness on disparities is insignificant in the regions that are further away from the border. Therefore the regions that are located closer to the Austrian borders growing more than the interior regions, and this leads to a relatively more balanced development, in other words, regional disparities are declining.

Martincus (2010) studied how the trade policies affect the Brazil's economic geography between 1990 and 1998. The study of Martincus (2010) reveals that Brazilian regions increased their trade volume mostly with the Argentina regions. So, the increase in the trade integration between the Brazilian and Argentinean regions makes open regions as attractive points for the location choice. Industries with a high degree of sectorial openness tended to locate in such regions due to their advantageous arising from closeness to the Argentina borders. On the other hand, the domestic production directed firms tend to locate in the regions that have better infrastructure. Martincus (2010) suggests that the effects of trade openness on regional income inequalities depends on additional factors such as better access to the market and better infrastructure, etc.

Table 3.3. Summary of Empirical Trade openness and Convergence Literature

Authors	Sample	Variables	Method	Results
Hanson 1998	▪ Mexico ▪ 32 regions 1980-1993	▪ Sectorial data, ▪ GDP ▪ Export and Import	▪ Panel regression	▪ Trade liberalization contributed to the formation of the new industry centers in the northern Mexico.
Pernia and Quising 2003	▪ Philippines ▪ 14 Regions 1988-2000	▪ GDP ▪ Export and Import	▪ Pooled OLS	▪ Openness promotes the economic growth, but it could not lead to more balanced regional development.
Chiquiar 2005	▪ Mexico ▪ 31 Regions 1970-2001	▪ Regional GDP per capita ▪ Export ▪ Import	▪ Panel regression	▪ There is a convergence pattern exist until the NAFTA enacted, then the closeness to the market foster the regions closed to the US border and this lead to unbalanced development across the regions.
Kanbur and Zhang 2005	▪ China ▪ 30 Regions 1952-2000	▪ GDP ▪ Trade to GDP ratio	▪ Time Series OLS	▪ Regional disparities in China have increasing patterns especially after China opens its door to international market.
Rodriguez-Pose and Sanchez-Reaza 2005	▪ Mexico ▪ 32 Regions 1980-2000	▪ GDP ▪ Export ▪ Import	▪ Cross-region OLS	▪ The north and south division regarding regional income inequalities are increased after the GATT and NAFTA agreements due to the closeness to the market effect.
Faber 2007	▪ Mexico ▪ 32 Regions 1993-2003	▪ GDP ▪ Sectorial GDP ▪ Export and Import	▪ Panel with region and sector fixed effects	▪ The change in the spatial inequalities of regions depends some factors besides the trade volume of the regions.
Gonzales Rivas 2008	▪ Mexico ▪ 32 Regions 1940-2000	▪ GDP ▪ Human capital ▪ Infrastructure ▪ Trade openness	▪ Panel with region fixed effects and spatial lags	▪ Initially richer regions benefits more than the initially poorer regions and this lead to an unbalanced development across the regions.
Redding and Sturm 2008	▪ West Germany ▪ 119 German cities 1919-2002	▪ GDP ▪ Human capital ▪ Public Investment ▪ Infrastructure ▪ Trade openness	▪ Panel with city and decade fixed effects	▪ After the unification of the West and East Germany, the cities that are located closer to the border are growth more and this leads to a convergence across the regions.
Chiquar 2008	▪ Mexico ▪ 31 Regions 1990-2000	▪ Regional GDP per capita ▪ Export ▪ Import ▪ FDI	▪ Panel with region effects	▪ The effects of the trade openness on regional income inequalities depend on the characteristics of the regions. The location choice of the FDI determined the level of the effects.
Sanguinetti and Martincus 2009	▪ Argentina ▪ 24 Regions 1985-1994	▪ GDP ▪ Sectorial GDP ▪ Export and Import	▪ Panel with region, industry and year fixed effects	▪ Trade liberalization cause to the dispersion of the manufacturing activities from the city core Buenos Auras to the low industrialized regions.

Table 3.3. (cont.)

Brülhart , Carrere and Trionfetti 2010	▪ Austria ▪ 422 Regions 1975-2002	▪ GDP ▪ Sectorial GDP ▪ Trade to GDP ratio	▪ Panel with region fixed effects	▪ Austrian regions closer to the borders within 25 km are growth more due to the opening up to the old communist neighbors and this border effect leads to more balanced development patterns.
Martincus 2010	▪ Brazil ▪ 27 Regions 1990-1998	▪ Employment data ▪ GDP ▪ Export and Import	▪ Pooled OLS	▪ The increased trade volume between the Brazil and Argentina leads to emergence of the new industrial centers close to the Brazil and Argentina border.
Naranpa nawa and Arora 2014	▪ India ▪ 17 Regions 1992-2010	▪ GDP ▪ Export and Import	▪ Pooled OLS	▪ In the short run, trade liberalization will have a positive impact on the rich and fast-growing middle-income states and a marginal or negative impact on the poor states. ▪ Trade liberalization is likely to widen the gap between the rich and the poor states in India in the short run.
Pose and Ezcurra 2013	▪ 47 Countries 1990-2007	▪ Trade ▪ FDI ▪ Tariff rate ▪ Export and Import	▪ Pooled Panel	▪ The study indicates a positive association between the degree of economic openness and the magnitude of within-country regional disparities. ▪ The effect of economic globalization on the regional disparities contingent with the level of economic development of the country.
Darku 2011	▪ Canada ▪ 10 regions 1981-2006	▪ GDP ▪ Export ▪ Import ▪ Tariff rate	▪ Pooled OLS	▪ There is a convergence pattern exists in Canada which is %4 per year and the NAFTA has a negative effect on the regional convergence pattern. ▪ The fiscal transfers which are under the federal equalization program accelerated the convergence speed of the Canadian regions.
Özyurt and Daumal 2010	▪ Brazil ▪ 469 Regions 2004-2007	▪ GDP ▪ Export ▪ Import ▪ Human capital	▪ Pooled Panel	▪ Trade openness promotes the local economic development and effect negatively the per capita income of the neighbor regions. ▪ Human capital has a positive impact on the growth of the Brazilian regions.

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Table 3.3. (cont.)

Daumal and Özyurt 2011	▪ Brazil ▪ 26 regions 1989-2002	▪ Trade ▪ FDI ▪ Tariff rate ▪ Export and Import	▪ Panel with region effects	▪ Trade openness is more beneficial to states with a high level of initial per capita income and therefore contributes to increased regional disparities in Brazil. ▪ Trade openness favors more industrialized states, well-endowed in human capital, rather than states whose economic activity is mainly based on agriculture and farming.
Daumal 2013	▪ India and Brazil ▪ 1985-2004	▪ GDP ▪ Export ▪ Import	▪ Time series regression	▪ Brazil's trade openness contributes to a reduction of regional disparities across the regions. While the inverse effect is for India. India's trade openness fosters the regional income inequalities across the regions of India. ▪ In both countries, inflows of foreign direct investment are found to increase regional inequalities
Pose and Gill 2006	▪ 8 Countries ▪ 1975-1999	▪ GDP ▪ Sectorial Export ▪ Sectorial Import	▪ Trade Composition Index	▪ There is an increase exist in regional disparities both across and within the regions of the countries. ▪ The trade composition cannot have an effect on regional disparities if there is no trade. ▪ If there is an increase in sectorial shift from the agriculture to manufacturing trade, the disparities would be fall. ▪ If the regional disparities rise the agriculture to manufacturing ratio will fall due to the loss of the primary economic activity.
Hye, Lau and Tourres 2014	▪ India	▪ GDP ▪ Export ▪ Import ▪ Tariff rate	▪ Pooled Panel	▪ Human capital and physical capital are positively related to economic growth in the long run. ▪ Trade openness index negatively impacts on economic growth in the long run. ▪ The impact of trade openness index on economic growth is not stable throughout the sample.

The table is created by author's own assessment.

Naranpanawa and Arora (2014) studied the effects of trade openness on regional disparities in India between 1992 and 2010. The study reveals that opening up to trade effects the rich and fast growing middle income regions positively, and effects the poor regions, negatively. So, that means the trade liberalization is widening the gap between the rich and poor regions in India.

Rodriguez-Pose and Ezcurra (2013) studied the effects of economic globalization on the regional inequality across the 47 cross-countries between 1990 and 2007. The results indicate a significant correlation between the opening up to trade and regional disparities across the countries, it means that countries which have the higher level of regional disparities, also have a greater degree of economic integration with the rest of the world.

Darku (2011) investigated the impact of the trade liberalization and the fiscal equalization policy on regional income disparities across the Canadian regions between the 1981 and 2006. The study reports that the regional income inequalities across the regions are decreasing and the expansion of the NAFTA de-accelerated the convergence speed among regions. As a policy of the Canadian government, the fiscal transfers, which are under the equalization program, accelerated the speed of convergence.

Özyurt and Daumal (2010) focused on the trade liberalization process and its impact on the regional disparities across the Brazilian regions between 2004 and 2007. The study reveals that trade openness fosters the economic growth of the regions locally, while it has a negative effect on the neighbor regions. Besides that, the regions that have the high level of human capital benefit more from the trade liberalization.

Daumal and Özyurt (2011) analyzed the impact of trade openness on regional disparities in Brazil between 1989 and 2002. The authors suggest that trade openness induces the widening the regional income gaps. Furthermore, trade motivates more the richer regions more than the poorer regions, and this leads to an unbalanced development pattern. Authors note that the composition of the regional trade volumes has different impacts on the growth of the regions. Such that exporting high value added or high tech goods and agricultural goods have different level of effects on the productivity and economic growth of the regions.

Daumal (2013) investigated the impact of trade openness on regional income inequality across the regions of Brazil and India between 1985 and 2004. India and Brazil are different cases regarding their regional responses to opening up to international trade. The gap across India regions is increasing, while such gap across the

Brazilian regions is decreasing. Yet the trade volume and the trade openness are significantly increased in both of the countries. The study of Daumal tries to shed light on the effects of the trade openness on regional income inequality by investigating these two inverse responding countries. The study reports that the explanation for these two responses is related to the trade composition of the regions. The agriculture trade favors the poor agricultural regions of Brazil, and this lead to a decrease in the overall regional income inequalities. While a rise in export that is combined with a shift from exports in agriculture to exports in manufactured products, is the reason behind the rise of the overall regional inequality among Indian regions.

The study of Rodriguez-Pose and Gill (2006) focused on the effects of trade openness on regional disparities in 8 countries between 1975 and 1999. The study reveals that there is an increasing trend existing across the regional inequalities within the developing countries, while trade openness leads to decrease in the regional inequality of developed countries. Besides that the sectorial composition of the trade is rather significant in the evolution of the regional disparities. According to the study, three hypotheses come to the fore; first, if there is no correlation between regional disparities and the trade composition index, that means trade composition may not have any impact on spatial disparities. Second, if the agricultural to manufacturing export ratio (trade composition index) fall, the regional disparities also tended to fall. The third is a fall in agricultural relative to manufacturing exports is associated with a rise in regional disparities, which means that if the disparities rise, the trade composition index will also rise.

Hye et al. (2014) investigated the effects of trade openness on regional income inequalities in India. The authors used an openness index. The results of the study reveal that human capital and physical capital are positively related with the economic growth in the long run, while the trade openness has a negative impact on the economic growth. The studies covering both the developed and developing countries and cross-country studies reveal that developed countries benefits more from the trade liberalization, so, trade liberalization favors these countries for reducing their regional disparities.

Contrary to the consensus on the developed countries, the studies differ in accordance with their outputs related with the impacts of trade openness on regional income inequalities in developing countries. In other words, the effects of trade liberalization on regional income inequalities in developing countries are not as clear as

in the developed countries. With this regard, many studies suggest that trade openness has a negative effect on the regional income disparities in developing countries like Mexico (Rodriguez Pose and Sanchez Reaza 2005, Gonzales Rivas 2008), Brazil (Daumal and Özyurt, 20011), India (Naranpanawa and Arora, 2014), Philippines (Pernia and Quising, 2003) and China (Kanbur and Zhang, 2005). While, some suggest that trade openness fosters the poor regions in the developing countries like Brazil (Daumal 2013, Martincus 2010) and Argentina (Sanguinetti and Martinicus, 2009). Additionally, some studies also indicate that further investigation by using decomposed trade and income analyses and models is needed.

In the line with the discussions, so far, it is not wrong to suggest that the impact of trade openness on the regional income gaps depends on additional factors like characteristics of the countries and regions (Faber 2007, Chiquar 2008). The region's major economic activities, trade compositions, quality of infrastructure, level of human capital, productivity, closeness to market etc. are the only few ones.

In next part, we focused on the Turkish economy regarding the evolution of the regional disparities, regional growth and convergence.

3.3. Empirical Convergence Literature in Turkey

In this section, we tried to discuss and summary the literature covers regional inequality and convergence in Turkey. In this literature, there are lots of studies existing (Filiztekin 2009, Yıldırım 2006 2010, Doğruel 2006, Gezici and Hewings 2003, Gezici 2006, Gezici and Köse 2005, Özatağan 2007, 2012 Celebioglu 2010, Elveren 2010, Karaca 2004, etc.) and they try to shed light on whether the regional income inequalities in Turkey increase or decline. With this regard, when the related literature reviewed, it is possible to observe that the present studies indicate the lack of consensus. In other words, some studies reveals that the regional income inequalities in Turkey decline and poor regions have a tendency to growth more than richer ones (in the line with the Sala-i Martin and Xavier (1996)). Besides that, some studies report the existence of the conditional convergence across the regions. Conversely, some studies suggest that regions of Turkey are diverging. Table 3.4 clearly depicts the studies dealing with regional income inequalities in Turkey. The lack of long term data in Turkey causes the existence of different results.

Filiztekin (1998) tested β and σ-convergence analysis using provincial level data between 1975 and 1995. Filiztekin (1998) used several variables like migration, male and female education, and also sectorial variables in order to tests the effect of these variables on the regional growth. The study clearly reveals that the regions are converging, but conditionally. Increasing education of females in a region significantly contribute to such convergence while male education "surprisingly" has a negative effect on the growth of the regions. Fertility rate which is measured by the ratio of children ages up to 4 to the number of females' ages between 15 and 49 has a significant impact on the growth of the provinces. On the other hand, migration and public investment also affect the growth of the provinces positively but contrary to the literature their impacts are very small. Additionally, the outputs reveal the existence of the sectorial convergence, but agriculture and services are constant. Besides that changes in sectorial composition of output have significant impact on growth and convergence pattern of the regions. Filiztekin (1998) suggests that the main reason behind the convergence is the sectorial movements and their shifts in Turkey.

In their study, Gezici and Hewings (2004) find a weak evidence of convergence across the regions of Turkey for the period between 1990 and 1997. The study reveals that GDP per capita is not randomly distributed within space but it is highly clustered and spatially agglomerated across the regions. Besides that, Gezici (2006) reports existence of a convergence pattern across the regions of Turkey for the same time period.

Another study suggesting the convergence of the regions is conducted by Dayıoğlu et al. (2007). By analyzing the effects of gross domestic product per capita, population, share in GDP, population growth rate, and urbanization rate, the study reveals that the gap between the regions is decreasing which indicates the existence of the convergence trend. Additionally, the authors suggest that the improvement of income distribution in regions is mostly caused by the increased level of rental income from land.

Kılıçarslan and Ozatagan (2007) studied the regional convergence of Turkey. The study used population weighted income data for the 1987-2000 period in order to analyze whether the population change in cities affect the income disparities. The results suggest that there is a converging pattern across the provinces of Turkey and the convergence pattern is affected by changes in population shares of provinces rather than just provincial income growth. This study clearly shows that without analyzing the

population and income changes of the regions, the convergence analyses would give biased outputs.

By analyzing the relation between public capital and regional convergence Önder et al. (2010) examine the dynamic effects of public capital, and transportation capital stocks on regional convergence in Turkey at NUTS II level for the period between 1980 and 2001. The results show that σ-convergence and conditional convergence exist, and per capita public capital stock has a positive effect on per capita income for such period. The study reveals that transportation based infrastructure investments cause a rise in regional disparities rather than a convergence in Turkey.

The study by Yıldırım et al. (2009) analyzes the regional income disparities across the regions of Turkey in different NUTS levels for the period between 1987 and 2001. This study distinguishes from other studies by its extended scope regarding several geographical divisions such as west/east, interior/coast. Besides that the study also uses decomposed Theil indices for analyzing the between and within effect of regional income disparities in Turkey. In the line with such analyses, the study reveals that income inequalities (Theil coefficient) have an increasing tendency in the periods of economic expansion, and it is decreasing in the periods of recession. Concordantly, the study also suggests that Eastern and Southeastern provinces also show higher speeds of convergence. While the effects of higher average unemployment and a higher fertility rate appear to hinder economic growth of regions, and the public spending widening the gap between Western and the Eastern provinces.

Arslan et al. (2011) investigated the regional disparities in Turkey, and also questioned whether regions of Turkey are diverging or converging. By criticizing the literature the study reveals that regions are converging in terms of income. According to the study, this result arises for two reasons. First, the new distribution pattern and the technological improvement of transportation facilities across the regions, and second, with a higher probability, the Kocaeli earthquake in 1999 has led to such pattern. Therefore the changes in transportation networks and facilities, and the natural hazards lead to decreases in the gap across the regions in Turkey regarding income disparities.

Table 3.4. Summary of the Empirical Regional Growth Literature in Turkey

Authors	Sample	Variables	Method	Results
Filizteki n 1998	▪ 1975 - 1995 ▪ 67 province level	▪ Migration ▪ Male and Female Education ▪ Sectorial productivity	▪ β-convergence ▪ σ-convergence	▪ Conditional convergence. ▪ Female education has positive effect. ▪ Male education has a negative effect. ▪ Fertility has an important role in growth of regions. ▪ Sectors except agriculture and services convergence. ▪ Changes in sectorial composition of output has significant effects on growth
Temel, Tansel and Albersen 1999	▪ 1975 – 1990 ▪ 67 Province level	▪ The aggregate labor productivity ▪ Employed population	▪ Markov Chain Model	▪ Polarization. ▪ Persistent spatial pattern in labor productivity in three major industrialized cities. ▪ The lack of infrastructure effects the eastern provinces.
Selim and Küçükçi ftçi 1999	▪ 1994	▪ 1994 Household Income Distribution Survey	▪ Gini coefficient	▪ Increasing inequality. ▪ Zonguldak has the least unequal distribution of income distribution Istanbul and Adana have the most unequal distribution.
Özmucu r and Sibel 2002	▪ 1987 - 1994	▪ 1994 Household Income Distribution Survey	▪ Gini coefficient	▪ Inequality between regions increased. ▪ Within categories are the main contributors in rural areas whereas the between categories are the major contributors in urban areas.
Erk, Ates and Direkci 2000	▪ 1979 – 1997	▪ GDP per capita	▪ β-convergence ▪ σ-convergence	▪ The income inequality gap is increasing. ▪ Regions are converging except Marmara region.
Tosun, Timothy and Öztürk 2003	▪ 1985-2001 ▪ Nuts1 level	▪ GDP per capita ▪ Tourism statistics ▪ Human Development Index	▪ Shift and Share analysis	▪ Tourism policies increased the regional disparities between west and east of Turkey.
Doğruel and Doğruel 2003	▪ 1987 1999 ▪ 67 province level	▪ GDP per capita	▪ β-convergence ▪ σ-convergence	▪ The gap between east and the west is increasing. ▪ All fast developing cities are located west part. ▪ Openness in developing countries contributes only the convergence among the rich regions or cities. ▪ All provinces converge, but only σ-convergence can observe among the rich provinces.

(cont. on next page)

Table 3.4. (cont.)

Karaca 2004	▪ 1975 – 2000	▪ The share of agriculture in the GDP	▪ β-convergence ▪ σ-convergence	▪ Divergence among the West and the East part of Turkey.
Gezici and Hewings 2004	▪ 1980 – 1997 ▪ 67 Province level	▪ Annual population growth ▪ Urbanization rate ▪ Migration rate ▪ Public investment per capita ▪ Private investment per capita ▪ Agricultural employment	▪ Theil index ▪ Moran's I analysis	▪ Little evidence of convergence. ▪ GDP per capita is not randomly distributed, but highly clustered and spatially dependent.
Aldan and Gaygısız 2006	▪ 1987 – 2001 ▪ 67 Province level	▪ GDP per capita	▪ Markov Chain Model ▪ β-convergence	▪ No convergence among provinces. ▪ Consistent increase in inequality.
Kırdar and Saracoğlu 2006	▪ 1975-1990 ▪ 67 provinces	▪ GPP per capita ▪ Provincial internal migration rates ▪ Provincial population density ▪ Emergency of the provinces	▪ β-convergence ▪ σ-convergence	▪ Absolute divergence across Turkish provinces. ▪ Poorer provinces have the relatively poorer growth performance. ▪ The effect of migration on a regional growth rate is negative and significant.
Gezici 2006	▪ 1979 – 2001 ▪ 67 Province level	▪ Different regional sub-divisions such as, geographical regions, functional regions, coastal interior and east West regions	▪ Theil Index ▪ Moran's I analysis	▪ Overall inequalities are decreasing. ▪ Rich provinces are becoming stronger rather than expanding their spillover effects to other provinces. ▪ Distribution of GDP per capita highlights the "spatial peripherally".
Dayıoğlu and Beşlevent 2007	▪ 1994 ▪ Nuts 1 level	▪ GDP per capita ▪ Population ▪ Rate of population increase ▪ Urbanization rate ▪ Total fertility rate ▪ Literacy rate	▪ Atkinson decomposition ▪ Gini coefficient ▪ Squared coefficient of variation	▪ Income inequality is decreasing across the regions. ▪ Spatial distribution of unauthorized housing in Turkey effects the inequality.

(cont. on next page)

Table 3.4. (cont.)

Kılıçaslan and Özatağan 2007	• 1987 – 2000 • 67 province level	• Population weighted GDP per capita • Within and between effect of regions in different time intervals	• Decomposition analyses • Population weighted regression	• A converging pattern across the provinces. • The increase in some provinces' per capita income, although their decreasing population shares, is caused by the relative population decrease. • The population shares of provinces are a vital source of convergence of per capita income.
Güven 2007	• 1979 – 2000 • 67 province level	• GDP per capita	• Theil index • Gini Coefficient • Theil decomposition	• Increasing inequality among regions. • Subsidized regions are the major contributor to the regional inequality.
Yıldırım, Öcal and Özyıldırım 2009	• 1987-2001 • Nuts 1 level • Nuts 2 level • Nuts 3 level	• GDP • Average level of education • Fertility rate • Average level of unemployment • Governmental expenditure	• Theil index • Theil decomposition • GWR models • β-convergence • σ-convergence	• The inequality between regions is decreasing. • The gap increasing in periods of economic expansion and to decreasing in periods of recession • Eastern and Southeastern provinces showed higher speeds of convergence • Higher average unemployment and a higher fertility rate appear to hinder economic growth. • Public spending widening the gap between Western and the Eastern provinces.
Celebioğlu and Dall'erba 2010	• 1995-2001 • 76 province level	• Public investment • Region's university degree population	• Quartile maps • Exploratory spatial data analysis • Moran's I • LISA statistics for local spatial autocorrelation	• Moran's I results indicate positive (and significant) spatial autocorrelation. • Maps revealed the gap between East and West in terms of per capita GDP and education levels.
Elveren and Galbraith 2010	• 1980 – 2001 • 67 province level	• Sectorial data	• Theil Index • Sectorial Analysis	• Pay inequality in Turkey increased. • Inter provincial inequality increased sharply between 1987 and 1995, it is declined and then reached to the 1991 level in 2001. • There is no convergence between regions • An impoverished East and affluent West, has been unchanged during the years of neo-liberalism

Table 3.4. (cont.)

Önder, Deliktaş and Karadağ 2010	▪ 1980-2001 ▪ Nuts 2 region level	▪ Population share of the region in total ▪ GDP per capita ▪ Share of public capital on average ▪ Share of transportation capital in total transportation capital ▪ Share of transportation capital in total regional public capital on average	▪ Pooled regression ▪ Least squares dummy variables ▪ Generalized method of moments (GMM estimator) and also GMM in differences	▪ σ-convergence and conditional convergence exist. ▪ Per capita public capital stock has a positive effect on per capita income at NUTS 2 level regions. ▪ Transportation capital stock has negative and significant sing in all of the models. ▪ Transport infrastructure investment cause regional disparity rather than convergence in Turkey.
Arslan and Kula 2011	▪ 1975-2001 ▪ 67 province level	▪ GDP per capita	▪ Panel regression ▪ LM unit root test	▪ Strong evidence for convergence except for the provinces of Bitlis and Erzurum.

The table is created by author's own assessment.

Furthermore, studies suggesting divergence are also quite a lot as can be clearly seen from the table 3.4. As a start, Temel et al. (1999) analyzed the regional inequalities regarding the labor productivity. The study reveals the existence of a divergence pattern across the regions of Turkey, and these divergence tendencies are mostly caused by the productivity differentiation across the cities, it means that cities have various levels of productivity levels. The cities that involve high level of productivity are clustered and concentrated around the most developed three city, and also in the hinterlands. These cities attract the highly educated, highly skilled workers, and also the investments. So, it is not wrong to suggest that such economic externalities lead to an unbalanced development pattern across the regions of Turkey.

Özmucur et al. (2002) investigated the income disparities in Turkey and migrations effect on regional inequality. The study reveals that the inequality between regions is increasing in both rural and urban areas. The migration has a positive and significant effect on such divergence. The study suggests that the divergence based findings are related to the differentiation of the employment and income sources especially between the rural and urban parts of Turkey.

Erk et al. (2000) analyzed the convergence of regional incomes in Turkey at seven geographic regions level, and especially for the provinces that are covered by the Southern Eastern Anatolia Project, the study reports that the overall inequalities are diverging across the regions. While the regions, except Marmara region, have a convergence tendency. The study also reports that regions that have a mid-level of income can converge and growth faster.

The study of Tosun et al. (2003) focuses on the regional inequalities and the development of tourism sector in Turkey. According to the study the regional disparities between west and east have increased as the tourism oriented policies enhanced. The accumulation of the tourism regions, zones, and centers, and the allocation of tourism incentives into the western part of the Turkey, and the sun and see oriented external tourism demand directed all tourism related investment to the western part of Turkey, and this has led to an unbalanced regional development between east and west of Turkey.

Karaca (2004) analyzed whether the regions of Turkey converging regarding income inequality. With this regard the study suggest that the uncontrolled investments allocated for the underdeveloped regions (Priority Regions for Development, (PRD)) relocated towards the western and southern parts of Turkey rather than the underdeveloped eastern part, hence, this lead to an unbalanced development, and increasing regional inequalities.

Aldan et al. (2006) studied the evolution of the regional disparities, and the spatial dependence of income distribution in Turkey. The study reports the lack of convergence pattern. Authors note that parallel to findings of Gezici et al. (2004) the distribution of the income per capita is not randomly distributed across the regions, but it spatially clustered.

Güven (2007) investigated the impact of PRD policies on the regional income disparities across the regions of Turkey, and the study reports the existence of the divergence pattern. Güven (2007) uses the Theil and the Gini indexes for the poor and rich regions one by one for measuring the different spatial division. The study reports that the rich regions have a tendency to converge to each other more than the poor regions. According to the stud, the divergence pattern mostly derived from the selection criteria of the DDP regions and the implementation of incentive policies.

Kırdar et al. (2006) analyzed the impact of internal migration on regional disparities in Turkey for the period between 1975 and 2000. The study reveals that the

income gap across the regions is increasing. Poor regions have a relatively poor growth performance whereas the regions in west and east Marmara are growing more. Authors suggest that out-migration from low income regions would lead to a lower the rate of return on capital in such regions. In other words out-migration regions are experiencing low returns on capital and suffering from disincentive productive investments and this lead to a divergence pattern across the regions.

Elveren et al. (2010) studied the spatial distribution of the pay inequality and regional disparities in Turkey. The study reports that the income inequalities have a deepening trend. The study relates such deepening tendency to the shift in the policies from import substitution industrialization to export led economic growth.

Disparities between the regions can be seen as a result of the combination of different factors such as geographical locations, proximity to export or import gates, the level of infrastructure investments, historical experiences etc. Definition of the regional inequalities is also a crucial issue in order to analyze the reasons behind the regional inequalities. The reduction of regional inequalities will provide more fragmented market in the country, and it also provides more deep economic integration across the regions. Income inequality across the regions is one of the major reason that leads to the regional development disparities.

In this section, we evaluated the literature on the regional income disparities with different aspects. Additionally we also examined the similarities and differences of the studies regarding their periods, variables, methodology and results. As can be seen from the Table 3.4 some studies cover only the regional income inequities, however, majority of the studies discussed regional disparities in accordance with various aspects such as the effects of internal migration, population change, development of tourism sector, and increases in rents.

In terms of results, some papers reveal the existence of the convergence pattern across the regions of Turkey. On the other hand, some papers indicate the disparities have fluctuating patterns, increasing during the expansion periods, and decreasing during the crises and recovery periods.

Some studies distinguish from others by suggesting that disparities are increasing across the regions. Their basic idea is that the productive environment of the developed cities attracts the highly skilled and educated workers, and capital. These processes induce further the disparities.

All in all, still there is no consensus exist in the regional convergence literature that aims at investigating the regional unbalances and disparities in Turkey. We allocated next part to the discussion of the literature covering the relationship between trade and inequalities in Turkey.

3.4. "Trade and Convergence" Literature in Turkey

In this section, we focused on the discussions related to the interactions between the trade, growth and inequalities in Turkey. With this sense, table 3.5 obviously displays related studies and their main results.

Some studies exist in the literature, yet these studies mostly attempted to discover the causality relations between the overall growth and trade in Turkey. In other words, they tried to discover whether the trade and/or the growth affects the other, and how. Besides that, some studies attempted to discover how trade policies effect the growth in the long and short run.

Only few studies try to investigate the effects of trade openness on the regional income inequalities in Turkey. The study of Oktay and Gözgör (2013) examined the effects of trade openness on regional growth in Turkey for the 81 NUTS III level regions between 2002 and 2008 using dynamic panel estimation models. The study reveals the existence of an increasing pattern regarding regional inequalities across the regions of Turkey, and, more specifically, more trade fosters this inequality pattern. Besides that, trade openness also leads to a greater development in small cities than in the large cities. Additionally, the study reveals a negative relation between the size of city and its development.

Ghatak et al. (1995) investigated the causality between the trade and growth for the period between 1978 and 1990 by using Granger causality test. The study reveals that trade policies affect the growth in both the short and long run.

Yeldan (2000) studied the trade liberalization process of Turkey. He investigated the effects of the trade liberalization policies on growth, especially after 1980s. The study shows that trade liberalization policies fostered the economic growth in Turkey, but this growth pattern couldn't sustain over the years. Most importantly, the trade liberalization period fulfilled without any control and this lead to shrinkages in the local domestic production networks.

Utkulu and Özdemir (2004) focused on the Turkish economy between 1950 and 2000 by investigating the causality between growth and trade using an error correction model and exchange rate dissertation index. The study reveals that the trade policies from the late 1970s to the end of the 1980s effect the growth in long and short run. Yet this positive growth patterns could not sustain from the beginning of the 1990s.

Antonucci and Manzocchi (2006) studied the trade flows between EU and Turkey, and how such trade flows evolved over time. The study reports that analyses yield insignificant evidences about the effect of the additional trade between EU and Turkey, except only a weak trade effect exists in 1970s.

Doğruel and Doğruel (2006) worked on the effects of trade liberalization on the sectorial decomposition of the manufacturing, and their reflection on the regional inequalities. Firstly the study reveals that there is a slightly decreasing pattern existing regarding the regional income inequalities after 1980s due to the spatial spillovers of the textile industry from cores to the hinterlands. Yet this spillover process was not persistent. Besides, the study suggests that the trade liberalization does not create "systematic" change in the sectorial and spatial distribution of the manufacturing industry.

Yapraklı (2007) investigated the causality between the trade and financial openness and economic growth between 1990 and 2006 in Turkey by using Granger causality test. Study reports that there is a positive causality exist between the trade openness and economic growth, whereas it is negative for financial openness and economic growth.

Kar et al. (2008) investigated how trade liberalization effects the growth of Turkey and investigated such question between 1963 and 2005. The study uses three different indices for measuring trade liberalization, economic liberalization and financial development, respectively. The study of Kar et al. (2008) clearly shows that trade liberalization and financial development has a positive contribution to the economic growth.

Yucel (2009) analyzed the causal relations between the financial development, trade openness and economic growth in Turkey between 1989 and 2007. Yucel's study reveals that trade openness has a positive effect on growth while the financial development has a negative effect.

Table 3.5. Summary of the Trade and Growth Literature in Turkey

Authors	Sample	Variables	Method	Results
Ghatak, Milner and Utkulu 1995	▪ 1978-1990	▪ GDP ▪ Export and import	▪ Granger causality test	▪ Trade policy has a positive impact on the growth in both the short and long run. ▪ In the long run both physical and human capital accumulation effects the growth.
Yeldan 2000	▪ 1980-1999	▪ Distribution of income ▪ Investments ▪ Sectorial analysis	▪ Shift share analysis	▪ Export promotion policies and state led price incentives created sporadic increases in productivity in 1980s but they failed to generate a sustained increase in economic growth and accumulation.
Utkulu and Özdemir 2004	▪ 1950-2000	▪ GDP ▪ Export and import	▪ Error correction models ▪ Exchange rate distortion index	▪ Sustainable increase in exports in the 1980s has not been sustained in the 1990s.
Antonucci and Manzocchi 2006	▪ 1967 – 2001	▪ GDP ▪ Country dummies	▪ Gravity model	▪ Despite the 1963 Association agreement and the customs union launched in 1996, there is no evidence of additional trade between Turkey and the EU.
Doğruel and Doğruel 2006	▪ 1980-2000 ▪ Nuts 2 Level	▪ Leading industrial centers ▪ Hinterlands ▪ New industrial centers	▪ Gini Coefficient	▪ Trade liberalization does not create systematic change in the sectorial distribution of the manufacturing industries. ▪ Textile industry shift from major industrial regions to newly developed industrial regions. ▪ Slight decrease can be observed in regional inequality
Yapraklı 2007	▪ 1990 - 2006	▪ GDP ▪ Export to GDP ▪ Import to GDP	▪ Granger causality test	▪ Trade openness has a positive effect on growth, while financial openness has a negative in the long run
Kar, Peker and Kaplan 2008	▪ 1960-2005	▪ Export to GDP ▪ Import to GDP ▪ Financial liberalization index ▪ Trade openness index	▪ Time series analysis	▪ Trade liberalization and financial development positively contributes to economic growth.
Yucel 2009	▪ 1989-2007	▪ GDP	▪ Granger causality test	▪ Economic policies that affect financial development and trade openness will have positive impact on GDP and vice versa is also true

Table 3.5. (cont.)

Örnek and Elveren 2010	▪ 1980-2001	▪ GDP ▪ Trade openness ▪ Income Inequality	▪ Ordinary least squares method	▪ There is an increasing wage gap between skilled and unskilled workers. ▪ The pay inequality in the manufacturing sector as an accurate reflector of overall income inequality in Turkey.
Korkmaz, Çevik and Birkan 2010	▪ 1990-2008	▪ GDP ▪ Annual growth ▪ Trade/GDP	▪ Unit root test ▪ Treatment effect model	▪ As the trade openness increase, it affects the growth %0.17 directly. ▪ Financial liberalization increases the possibility of crisis in Turkey, but it also effect the growth significantly and positively.
Oktay and Gozgor 2013	▪ 2002-2008 ▪ 81 Province level	▪ Investment by government ▪ Population ▪ Trade ▪ Openness ▪ Regional development index	▪ Panel regression ▪ Regional development index consists of HDI, Life expectancy index, Adult literacy index, Gross educational index, GDP index	▪ Trade openness have a negative impact on the regional disparities. ▪ Negative relationship between the size of a province and its development. ▪ An increase in the openness of larger cities would cause relatively less effect on regional development than those in smaller cities. ▪ There is a spatial divergence in Turkey across provinces
Akkemik, Göksal 2014	▪ 1996-2001 ▪ 81 province level	▪ Export ▪ Import ▪ Sectorial Employment ▪ GVA	▪ Panel Regression ▪ Gini Index ▪ Coefficient of variation	▪ There is a declining trend exist across the regions of the Turkey as an output of Gini and CV indices. ▪ Scale of firms and resource intensity are crucial determinants for industrial disparities across the regions.

The table is created by author's own assessment.

The study of Örnek and Elveren (2010) focuses on the trade liberalization and income inequality of Turkey between 1980 and 2001. Existence of strong causality between the trade openness and growth is reported, additionally and accordingly, such causality leads to the deterioration of the income distribution in Turkey. This study, surely, does not report any output regarding the regional income inequalities, but it reports an increasing trade pattern, and increasing effect of trade openness on the overall income inequalities.

Korkmaz et al. (2010) studied the effects of financial openness on economic growth, and financial crises in Turkey between 1990 and 2008. The study reveals that trade liberalization leads to annually %0.17 increases in the growth of Turkey.

Akkemik and Köksal (2014) investigated the regional disparities in terms of industrial agglomeration and export volume of the regions between 1996 and 2001. The study used Gini index and coefficient of variation for measuring the regional disparities. The indexes yield declining patterns. Scale and resource intensity of firms are the main factors that lead to the industrial agglomeration of the regions. According to the study, the export volume doesn't have a significant effect on the regional disparities.

Two important features emerge from this literature summary. The first one is that there is a positive causality exists between the trade liberalization and economic growth, while the impact is negative for the financial liberalization. Export oriented growth policies lead to positive outputs for Turkey, while financed based development policies create a fragile economic environment to the crises (Ghatak et al., 1995, Yeldan 2000, Utkulu and Özdemir 2004, Antonucci and Manzocchi 2006, Yapraklı 2007, Kar et al. 2008, Klasra 2009, Yucel 2009, Örnek and Elveren 2010, Nart 2010, Korkmaz et al. 2010)

The second major point is that, more clearly, there is a limited number of studies existing in the literature which address the effects of trade openness on regional inequalities. The studies of Doğruel and Doğruel (2006) and Oktay and Gözgör (2013) covers different time intervals and also different research questions. But both studies measure the regional inequalities, and the study of Doğruel and Doğruel (2006) reports that there is a slightly decreasing pattern in regional inequalities. Oktay and Gozgor (2013) report the increasing pattern of inequalities. But, trade openness leads to more development in small cities, which indicates a negative relation between the city size and the development. In both studies trade openness has a positive effect on regional income inequalities, which means that trade openness promotes the disparities across the regions.

Precisely, from this point, next section aims at summarizing the historical background of economy of Turkey regarding the regional development and trade liberalization policies.

3.5. Literature Discussion

The lack of consensus in the convergence literature necessitate this part, hence, this part aims at synthesizing the empirical literature that we surveyed in section 3.1 to 3.4. The study of Baumol (1986) attracted the attention of the many scientists all around the world and then the convergence literature has grown with a snowball effect. Such snowball effect also appears in the variety of the results of the studies. Thus, some studies report convergence, divergence and/or persistent regional inequalities in empirical literature. Additionally, it is not wrong to suggest that such no consensus exist in the literature.

The economy of the countries, their democracy type, human capital level, infrastructure policy, trade regimes have a key role in such variety of the results. Both the cross country studies and regional convergence studies differing regarding their results. Besides that the lack of consensus in regional convergence literature is deeper (İslam 2000, Magrini 2004).

To start with the cross country empirical convergence studies, some studies report divergence (Dausa 2008, Mazumdar 2002) and convergence (Baumol 1986, Barro and Sala-i-Martin 1994). Convergence reporting studies also differ (like studies reporting absolute convergence (Caselli at al.1996, Kocenda 2001, de la Fuente 2000, Garafolo and Yamarik 2002) and conditional convergence (David 1997, Barro 1997)).

In regional convergence literature, some studies report divergence or constant inequities in both developed and developing countries. Some studies report conditional convergence for regional level cross country data (Lall and Yılmaz 2001, Carvalho and Harvey 2002, Ertur et al. 2006), for Turkey (Filiztekin 1998, Yıldırım et al. 2009), for South Korea (Evans and Kim 2014). Besides that some studies report absolute convergence (Badinger et al. 2003, Dall'Erba and J Le Gallo 2008), for US (Holmes et al. 2013, Carvalho and Harvey 2002), for Turkey (Arlan and Kula 2011, Önder et al. 2010), for China (Jiang et al. 2014).

Similarly, the lack of consensus is quite obvious in the empirical trade openness and regional convergence literature. More attention is attracted by the countries like Mexico, Brazil, India, China, Philippines etc. but quite slightly attention is paid for Turkey. The economy of the countries has a key role to understand the effects of trade openness on regional disparities. It is not wrong to suggest that trade openness is more

beneficial for the developed countries than the developing countries. In other words, in the literature that we surveyed, none of the studies report a positive impact of further trade on regional disparities in developed countries. Let's say, the effects of trade liberalization on regional income inequalities in developing countries are not as clear as in the developed countries. According to the literature developing countries differ regarding the impact of further trade on regional disparities.

With this regard, some studies suggest that trade openness fosters the poor regions in the developing countries like Brazil (Daumal 2013, Martincus 2010) and Argentina (Sanguinetti and Martinicus, 2009). While, some studies suggest that trade openness has a negative effect on the regional income disparities in developing countries like Mexico (Rodriguez Pose and Sanchez Reaza 2005, Gonzales Rivas 2008), Brazil (Daumal and Özyurt, 20011), India (Naranpanawa and Arora, 2014), Turkey (Oktay and Gözgör), Philippines (Pernia and Quising, 2003) and China (Kanbur and Zhang, 2005).

In a similar vein with the Faber (2007) and Chiquar (2008), the literature summary reveals that the impact of trade openness on the regional income gaps depends on additional factors like characteristics of the countries and regions. Such region specific characteristics are human capital level, technology adaptation capacity, better infrastructure, productivity, closeness to the markets etc. Additionally, some studies also indicate that further investigation by using decomposed trade and income analyses and models is needed.

If we look at the literature that focuses on the Turkey watchfully, it is clear that, the lack of consensus on whether the disparities are decreasing or increasing is consistent with the discussion so far. Divergence and convergence reporting studies are in half shares. With this regard, some papers reveal the existence of the convergence pattern across the regions of Turkey (Filiztekin 1998, Gezici and Hewings 2004, Dayıoğlu and Başlevent 2007 etc).

On the other hand, some papers indicate that the disparities have fluctuating patterns; the disparities are increasing during the expansion periods, and decreasing during the crises and recovery periods. Some studies distinguish from others by suggesting that disparities are increasing across the regions (Selim and Küçükçiftçi 1999, Erk et al. 2000, Doğruel and Doğruel 2003 etc). Their basic idea is that the productive environment of the developed cities attracts the highly skilled and educated

workers, and capital. These processes induce further the disparities. On the other hand, the crises are the major explanatory factor of the convergence reporting studies.

Unfortunately, there is only one study existing in the literature that it is focusing on Turkey, and it reports (Oktay and Gozgor, 2013) an increasing trend of regional inequalities in Turkey. Additionally, the study suggest that trade openness has a positive effect on regional income inequalities, which means that trade openness promotes the disparities across the regions.

3.6. Background for Trade Liberalization in Turkey

Economic transformation of Turkey takes most of the scholars' attention, and after the 1980s, it is generally studied with the process of Neoliberal policies (Pamuk 2014, Köse and Yeldan 1998, Togan 2010, Odekon 2005, Krueger 1985, Krueger and Aktan 1992, Rodrick 1988). The post-1980 period is a radical turning point for Turkey's economy. Young republic turned its face to the west. Therefore, Turkey gave importance to establishing trade agreements and partnerships with Western countries. This radical transformation makes significant the process of transformation in the 1980s. In this section, we separated the trade liberalization process of Turkey into several historical intervals, in accordance with the significant changes in the Turkish economy after 1923. Macro-economic and political discourse and practice differences are briefly mentioned.

We mostly refer to the Pamuk's studies (2014) for detaching the Turkish economic history into the several historical intervals in order to analyze the major changes and milestones. Pamuk (2014) investigated the Turkish economy in his seminal study and has partitioned it into the four main intervals in accordance with economic transition process of Turkish economy.

Turkey's economic liberalization started in the last period of Ottoman Empire. For a long period of the modern republic, economic liberalization was slowed down during between 1913 and 1980, and after 1980s economic liberalization was boomed quickly by the force of outsourcing paradigm. Pamuk (2014) started to discuss the economic transformation of the Turkish economy from 1920s, and named it as "1820-1913: foreign trade and foreign capital opened predominantly agricultural economy of the Ottoman". The period between the 1913 and 1980 is divided into two sub-periods in itself. The first period begins from 1913 to 1950 and covers the Second World War and

the world crisis which caused the domestic-oriented industrialization strategy and policies. The second period covers between 1950 and 1980, in this period, private sector-led industrialization through the import substitution strategies and policies took place. The period between 1980 and 2014 covers the process of the neoliberal policies and speedy globalization of Turkish economy (Pamuk 2014).

Inward-looking domestic-oriented industrialization model with statist policy was applied till the 1950s due to its young, war weary, agriculture based economy and Second World War (SWW). Turkey had newly emerging modern institution in the post 1923. Growth of the domestic industry is aimed by the strategies based on the import substitutions implementation.

Pamuk (2014) claim that import substitutions implementation began in the 1930s with the aim of producing goods by domestic industry. For the realization of this strategy and in order to be successful, some specific goods were restricted through the curtailment or the ban of imports. In order to motivate and encourage the local producers, cheap credits, tax immunity and other methods were applied (Pamuk, 2014).

After the 1960s military coup, the State Planning Organization (SPO) was established, and the planned development model is used. The first five-year development plan was implemented in 1963 in order to promote the industrialization of the domestic market in 1963 (Pamuk, 2014).

European Economic Community established the Common Market in 1962 in order to provide accordance among the economic community member countries regarding international trade, and gradually lowering the tariffs. Turkey joined such community in 1963 with the Treaty of Ankara, and a partnership was established between the Community countries and Turkey. Pamuk (2014) stresses that, in this period, especially labor migration from Turkey to European countries was very intense. This situation had a positive impact on Turkey's economy by reducing unemployment pressure, and by allowing the entry of foreign exchange in the next decades. In 1970s, the European States which were affected by the oil crisis, slowed down the taking worker from Turkey, and this situation has blocked the accessibility of Turkish economy to the foreign exchange, and then the high-interest foreign currency purchases has begun. Therefore, import substitution industrialization based import policies transformed into, the vaguely and randomly import policies and programs. The process till the late 1970s in terms of the trade liberalization of the Turkey's economy is expressed as heterodox period by Pamuk (2014).

According to Togan (2005) the annual import programs were regulated the imports of goods till the 1980s. The import of the goods is controlled by the programs which consist of the "liberalization list", "quota list" and a list arranged by the "bilateral trade arrangements". And such liberalization list was consisting of the "free import list (Liberalization list I)" and a "restricted list (Liberalization list II)". Importing the goods except these lists was prohibited. "Raw materials and spare parts" were considered under free list, and "the processed and semi processed goods and raw materials" were considered under the quota list (Togan 2010, Odekon 2005).

Pamuk (2014) suggests that statist policies of Turkey freight roles as an investor, a manufacturer and a regulator until the 1980s, such policies changed in 1980 (called as 24 January decisions), to the policies that positioning the Turkish state as a regulator of the distribution of the social income (Pamuk, 2014).

Pamuk (2014) suggests that the Turkish economy in the early 1980s to the present aims at outsourcing and entering into the process of integration to the world economy. In this process, firstly, the commodity market is opened to the international trade; secondly, the currency market flexibilization was done in 1983 after by a sharp devaluation. The import regime that based on trade quotas and tariff rates were reduced until the 1990s with a series of reforms. Then, the liberalization of financial markets, and articulation of the foreign capital process followed the developments mentioned above, and Turkey's economy displayed itself as "an open economy" in the 1990s (Pamuk 2014, Köse and Yeldan 1998, Togan 2010, Odekon 2005).

In the accelerated the process of economic liberalization in the second half of 1980, especially in 1989, the Turkish currency was transformed into the full convertible. Hence, this has reduced the barriers against the international flow of capital (Pamuk 2014, Köse and Yeldan 1998, Togan 2010, Odekon 2005).

We divided the trade liberalization process of Turkey into the eight differing sub periods in accordance with the various studies:

Planned Development Period

The First Five-Year Development Plan which covers a period between 1963 and 1967, was shaped by policies that aim at encouraging the production of goods in which Turkey is disadvantaged in internal and international markets. With these policies,

Turkey protected the domestic market until it gains competitiveness in the international market (Kazgan 2002).

Second Five-Year Development Plan (1968-1972) is more open than the first one in terms of trade policies. Accordingly, the newly established industries were intended to protect by import restrictions and the customs policy until they are able to cope with difficulties in establishment process (Kazgan 2002).

The main strategy of Third Five-Year Development Plan (1973-1977) is being "open". Kazgan (2002) claims that Turkey fulfilled its industrialization process in accordance with the realization of the challenges and competitiveness in the international market (Kazgan, 2002).

Compliance with the post-crisis 1981- 1982

The Turkish economy tried to overcome the effects of 1977-1979 currency crises by the help of a series of reforms based on the integration to the world. Köse and Yeldan (1998) claim that the regime of export, then, capital movements and regime of "cambio" were opened up to trade in the 1980s and in the following years. And then, the national currency was allowed to fluctuate. Financial markets have been liberalized by removing controls on the interest rates and credit allocation (Köse and Yeldan 1998). Economic priorities of the national economy during this period was that the economy gradually opened up, incentives for exports and crediting system is shifted from foreign markets towards the domestic market (Togan 2010, Odekon 2005).

Balkan and Yeldan (2002) claim that the main feature of the period between the 1983 and 1987 in terms of economic policy is the creation of the goods in order to export to the overseas markets, and narrowed domestic demand. The reel wages were reduced not only by gradually narrowing the legal possibilities of trade union movements but also by decreasing political force of labor unions. Balkan and Yeldan (2002) stress that wage of labor was reduced in the share of manufacturing value added in the private sector from 27.5% to 17% in 1987 and in the public sector it was reduced from 25% to 13% (Balkan and Yeldan 2002).

Growth to export 1983-1987

In the period of growth of export, Uygun (1993) and Togan (1993) suggest that the average real growth of export, as in dollar terms, was around 12.5% and 19.7% and

the national income grew at an average 6.5% per year after 1983. Yeldan and Balkan (2002) claim that the existence of the intensive subsidy system for export is the core reason under these positive developments. Studies reveal that "export-oriented industrialization" provided under the philosophy of "direct" incentives which corresponds to an average 25% of all export revenues, and it raised up to 35% in 1983 (Uygun 1993, Togan 1993).

Investments during this period have risen significantly. It appears that very few such increases are allocated to the manufacturing industries. In this period annual growth rate of investment allocated to the manufacturing industry remained at only 2.1% (Yeldan, 1995). With this regard, Yeldan (1995) claims that the contribution of the ignored capacities, the growth in the export and production are accelerated, but this improvements could not converted to a sustainable strategy with the fixed capital investments (Yeldan, 1995).

Expended process of structural adjustment reforms in 1988

The period between the 1981 and 1987 is famous with its labor income narrowing policies, which is called as "classic" growth process. Yeldan (1995) claims that policies starting from 1988 are began to clash with the "political community", and then, with such conflicts the structural adjustment reforms were ended. According to Yeldan (1995) Turkish economy was in the macro level recession in 1988. The national income growth rate fell from 6.5% to 2.1%, changes in the capital fixed investments turned into the negative; inflation rate skyrocketed to 75% level (Yeldan 1995).

Financial liberalization 1989 – 1994

Yeldan and Köse (1998) claim that, in 1989, the abolition of controls on international capital movements, the last ring of financial liberalization has been carried out. All controls on outward capital movements were removed; financial markets were open to for a short-term hot money speculation (Yeldan and Köse 1998).

Yeldan (1995) notes that the experience of Turkey's between 1989 and 1995 are quite raw and shallow for the integration to the international market with an uncontrolled manner and early speculation in the international capital caused a damage in Turkey.

After 1994 the financial crisis and post-crisis adaptation 1994-1997

In 1993, the rate of exchange was logged behind the inflation of domestic prices and balance of payments increased, account deficit reached to 6.4 billion and caused the depreciation in 1994 economic crisis.

According to Balkan and Yeldan (2002) strategic choice made by the government during 1994 financial crisis aims at protecting the capital incomes. The stabilization package published in April 1994 was based on the classic tight monetary policy and narrowing the domestic demand by pressing the wages. Therefore, the stabilization package tried to develop internal and external borrowing facilities with high interest rate policy while adding stability to commodity market in recession after cooled the economy (Balkan and Yeldan, 2002).

The most important intuitional transformation that took place in 1990s is a customs union agreement signed with the EU in 1995 (Yeldan, 1988). Although, Turkey's relations with the EU extends to Ankara agreement signed in 1963, a progress cannot be provided in point of membership, customs union agreement was signed with the entry into force of the agreement (Pamuk, 2014).

1997-2002

The main reasons behind the lack of increases in trade between Turkey and the EU after the agreement of Custom Union are stressed by the Pamuk (2014) these are the low level of tariffs prior to agreement and the crisis faced by the economy (Pamuk, 2014). First crisis is between 1990 and 1991, according to the Pamuk (2014), although Turkey's economy was able to avoid the Asian economic crisis accrued in 1997, but still it could not escape from the crisis. Besides that as a result of crisis, 6 billion dollars of foreign investments left from Turkey. After that, the real sector was adversely affected by increased interest and declined financial system (Pamuk, 2014).

With this regard, Pamuk (2014) claims that, in 1999, non-continuation of the macro imbalances in public sector was realized, and renewal of the implementation of a new stabilization program by providing support from the IMF was decided. Even though the program launched in 2000 was successful by reducing the interests. Problems of private and public banks resulted in a major crisis in early 2001 (Pamuk, 2014).

2002-2014

Banking and financial sector crisis in 2001 has influenced the economy of Turkey deeply. Due to economic openness in public and private banks, nightly rater is raised up to 6000 percent in 2001 (Pamuk, 2014). The Government had to abandon currency peg and program started against the large amount of capital outflow and decrease in exchange reserve. Pamuk (2014) notes that Lira lost the value more than 50 percent against other currencies, the crisis that started in the financial sector has also lead to decreases in production (Pamuk 2014, Akyüz and Boratav 2003, Özatay 2009).

New program prepared with the IMF's support which includes both the stability measures and longer term structural and institutional changes (Akyüz and Boratav, 2003). According to Pamuk (2014) the program was targeted to create balanced budget instead of the deficit and changing the budget balances radically for the long term stability. Besides that it was also envisaged the more fluctuating exchange rate regime instead of trying to get inflation under control by keeping low loss of value in Lira (Pamuk, 2014). Pamuk (2014) claims that 2001 program contains different elements from other programs prepared in accordance with agreement with IMF's support after 1980. Accordingly, it has accepted that markets can have negative consequences on their union and need to be controlled to some extent, instead of leaving the markets to the functioning of the price mechanism (Pamuk, 2014).

Within the scope of such program, Pamuk (2014) stresses that the program was adopted by Justice and Development Party (AK Party) government after 2002, and AK Party has renewed the membership application made during the Özal government which was rejected by the EU in 1987 (Pamuk 2014, Sönmez 2011). Pamuk (2014) suggests that AK Party's adhering to fiscal discipline, integration to Europe and export oriented industrialization strategy was supported by the capital environment. With this synergy, Turkey's EU membership was accepted in 2005, and then, AK Party have followed polices that are compatible with EU until this date in order to stabilize the economy (Pamuk 2014, Yılmaz 2011).

With this regard, however, Turkey turned its face to western world, Turkey also established economic and political partnership with western economies, it also took place as a member in transnational trade institutions such as Economic cooperation organization (ECO), Black Sea economic cooperation (BSEC) and Euro Mediterranean partnership. ECO trade agreement (ECOTA) was signed in 1985 between Afghanistan,

Pakistan, Tajikistan and Turkey with the perspective of a sustainable economy in 2003, but BSEC was signed in 1922 (Togan, 2010).

Table 3.6. Milestones in the Economy of the Turkey

Date	Major Events and Changes in Turkey's Openness	
1945	▪ Integration to United Nations	
1947	▪ Integration to IMF and World Bank	
1947	▪ Participation at General Agreement on Tariffs and Trade (GATT)	
1949	▪ Integration to the European Council	
1950s	▪ Various mixed of trade restrictive measures such as tariffs, taxes, surcharges, import quotas, advanced deposit requirements and foreign exchange, protected domestic industries	▪ Orthodox Stabilization Policy(Yeldan, 2001)
1958	▪ Integration to the International Maritime Organization (IMO)	
1960	▪ Military Intervention	
1960	▪ Integration to the OECD	
1962	▪ Integration to the UEFA	
1969	▪ Integration to the Organization of Islamic Cooperation (OIC)	
1972-1977	▪ Vigorous public investment programs ▪ Expending the domestic production capacity in heavy manufacturing and capital goods such as machinery ▪ State economic enterprises ▪ Development of private industry ▪ Protectionist trade regime ▪ Represented financial system enabled cheap finance to fixed capital investment in manufacturing	▪ Industrialization strategy based on import substitution getting deeper.
1973	▪ Integration to the Organization for Security and Co-operation in Europe	
1977-1980	▪ Orthodox stabilization package	▪ Foreign exchange crisis
1980	▪ Military Intervention	
1980	▪ All imports were regulated by annual or semiannual input programs ▪ Free trade import list ▪ Restricted list ▪ Quota list ▪ EEC consolidated list ▪ Enumerating under bilateral clarity arrangements	▪ Trade liberalization with regulated lists. ▪ Post crisis adjustments
1981	▪ Export promotion with strong subsidy components and gradually phased import liberalization	▪ Transfer of some export goods from liberalization list I to list II
1983	▪ Lowering production cost ▪ Squeezing domestic absorption	▪ Continued erosion of wage incomes. ▪ 3 list era. ▪ Import system reform ▪ Export led growth
1984	▪ Banks were allowed to accept foreign currency ▪ Explicit prohibited list ▪ Import subject to permission ▪ Liberated list (Enumerated the goods could be greatly imported)	
1985	▪ Integration to the Economic Cooperation Organization (ECO)	
1985	▪ Free Zones Law	

(cont. on next page)

Table 3.6. (cont.)

Year		
1986	▪ Taxes changed from domestic protection to import of certain commodities ▪ Support and prize stabilization ▪ Resource utilization support fund	
1987	▪ Istanbul stock exchange re-opened	
1988 1989	▪ Broad revision	
1990	▪ Integration to European Union ▪ Convertibility of the Turkish lira	▪ Un regulated financial regulations
1992	▪ Integration to the Black Sea Economic Cooperation Organization (BSEC)	
1993	▪ Closure of some border gates in the eastern part of Turkey	
1994	▪ Financial Crisis	
1995	▪ Transformation from GATT to World Trade Organization	▪ Reinvigoration of short term foreign capital led growth.
1996	▪ Integration to the Custom Union ▪ for industrial products	
1998	▪ Integration to the Developing Eight (D-8)	
1999	▪ Integration to the Group of 20 (G20)	▪ Contagion of World financial crisis.
2003	▪ New border gates on the Iran border	
2005	▪ Inward Processing Regime	▪ Developed and diversified export products exported to markets.
2009	▪ Integration to the Turkic Council	
2010	▪ Signing the treaty of Amity and Cooperation in Southeast Asia (ASEAN)	
2010	Signing the Anti-Counterfeiting Trade Agreement (ACTA)	

The table is created by author's own assessment.

According to Pamuk (2014), the most important priority in the AK Party's economy policy is the fiscal discipline. AK Party gave priority to the control of the public sector budgets and public depth, and the re-establishment of the budget balance was due to the enhancement of the taxes on consumer goods and privatizations. Additionally, Pamuk (2014) claims that the establishment of the budget balance led to take under the control of inflation and so the annual inflation rate fell below ten percent for the first time after 1960s (Pamuk, 2014).

Pamuk (2014) notes that ensured macroeconomic stability, privatization and the opening of accession negotiations with the EU led to the entry of foreign capital through direct investments. The foreign direct investments with the effect of increasing liquidity on a global scale increased to 10-15 billion dollars after 2005; previously it was around 2-3 billion dollars. Because, the foreign direct investments made by purchasing the firms or plants etc., Sönmez (2011) claims that the FDI made by foreign capital has very limited effect on the employment (Sönmez, 2011).

Yılmaz (2011) claims that as a result of developments with the significant increase in exports, macroeconomic stability of Turkey's economy have achieved a growth close to the averages of the long-term and the average of the developing economies (Yılmaz, 2011). Pamuk (2014) stresses that the global crisis emerged in 2008-2009 lead to slow growth trend. Investments in export and declines in consumption were experienced inevitably after the crisis (Pamuk, 2014).

According to Pamuk (2014), in the post-crisis period, economic policies could not steered the process correctly in the face of the fall of the rate of savings in the private sector. As a result of this, Turkey's economy maintained a structure constantly forces to take loans from outside to invest and consuming more than it produces.

Some of foreign direct investment was decreased after 2008, as a result of falling interest rates. Financing is provided to the external deficits with hot money. Increasing shopping centers and housing constructions in the city basing more external debt and more consumption have become the symbol of the economic model of current Turkish economy (Pamuk 2014, Yılmaz 2011).

Overall, from 1920s to 2015, Turkey has experienced a trade liberalization which might have significant effects on regional inequalities. In next part, we aim at investigating the evolution of the regional disparities, and how such evolution is effected by trade liberalization spatially by using various empirical methods.

CHAPTER 4

DATA, METHODOLOGY AND EMPRICAL ANALYSIS

This chapter is devoted to explaining our datasets and variables (in 4.1), illustrating the evolution of regional income inequalities using several time series indices (i.e. Theil, Coefficient of Variation) and demonstrating the spatial imbalances in income distribution by using maps as a tool (in 4.2). In sub-section 4.3, we document and discuss the recent trade liberalization process in Turkey, and then we explain our empirical spatial panel regression models (in 4.4) in which we try to model the regional growth patterns, test the convergence and assess the impact of trade liberalization on regional growth patterns. Finally, we summarize and discuss the estimation results in part 4.5.

4.1. Variable Selection and Data

With the help of the international literature that focuses on the trade openness and the growth patterns of the countries and/or regions, we define our dataset accordingly. The table 4.1 displays the variables to be used in this study.

The variables included are GDP per capita, GVA per capita, trade, export, import, and public investments per capita, infrastructure per capita, human capital, electricity consumption per capita and population. The sources of the variables along with the inspired literature, the available period range and the way how the variables are calculated are explained in detail in the table above. In last column, the acronyms of the variables are written.

Among others, real GDP per capita and real GVA per capita are selected as the main variables in measuring the income disparities across regions. We use real GDP per capita for 1975-2000 period and real GVA per capita for 2004-2011 period. Although these two variables do not measure exactly same thing, due to the lack of data, they are accepted as best and closest proxy to each other. The evolution of the regional income inequalities in Turkey has been analyzed in a widest time interval from the 1975 to 2011 except the 2001-2004 period which we lack data for. Other analyses and the tests (i.e.

regression estimates) cover a period from 2004 to 2011. In terms of spatial units, we try to implement our analyses for all sub-national levels (like NUTSI, NUTSII, NUTSIII levels, Appendix A) as long as the data is available. Spatial weights matrices are calculated and shown in Appendix B.

Table 4.1. Description of the variables

Variables	Time range	Source	Definition	Spatial level	Acronyms
GDP per capita	1975 - 2000	Dataset of Özütün, and Karaca	ln real GDP per capita	NUTS I NUTSII NUTS III	y-1
GVA per capita	2004 – 2011	Turkish Statistical Institute	ln real GVA per capita	NUTSII	y-1
Trade			ln (export+import)/ GVA nominal		trade
Export			ln (exports/GVA) nominal		ex
Manufacturing Export			ln (export manufacturing/total exports)		manuex
Agriculture Export	2004 – 2011	Ministry of Trade And Customs	ln (export agriculture/total exports)	NUTSII	agrex
Import			ln (imports/GVA) nominal		im
Manufacturing Import			ln (imports manufacturing/total imports)		manuim
Agriculture Import			ln (imports agriculture/total imports)		agrim
Public Investment per capita	2004 – 2011	Ministry of Development	ln public investment	NUTSII	public
Infrastructure per capita			ln total roads/area		road
Human Capital	2004 – 2011	Turkish Statistical Institute	ln student teacher ratio	NUTSII	humancapital
Electricity Consumption per capita			ln electricity consumption (MW)/Real gross GVA		electricity
Population			ln population		population

The table is created by author's own assessment.

As an indicator of trade openness, we use the sum of export and import divided by GDP or GVA in a given year. Regional road density and the length of road divided by regional area are used for measuring the infrastructure disparities across the regions. To measure human capital, the student teacher ratio is used; of course, it is not a perfect

but a fair measurement due to the lack of data. For measuring the public investment, the share of public investments to regions in total regional investment is used. Regional electricity consumption divided by GVA per capita is used for measuring the total private investments done in the regions.

Table 4.2. Descriptive Statistics

	y	y_1	openness	export	import	human capital	pop	road density
Mean	4,080	4,066	-2,039	-2,708	-2,932	2,794	12,335	-2,490
Median	4,047	4,039	-2,047	-2,695	-2,988	2,773	12,371	-2,522
Max	4,793	4,759	0,193	-0,730	-0,315	3,401	14,111	-2,123
Min	3,217	3,217	-4,583	-5,361	-6,174	2,398	11,180	-2,787
Std. D.	0,395	0,396	1,066	1,000	1,358	0,208	0,557	0,169
Observ.	182	182	182	182	182	182	182	182

	elect.	agrexp	manufexp	agrimp	manufimp	agrtr	manuftr	public
Mean	2,413	-3,324	-0,166	-2,572	-0,305	-3,437	-1,170	-3,911
Median	2,391	-3,277	-0,075	-2,315	-0,189	-3,200	-0,963	-3,991
Max	3,914	-0,541	0,000	-0,438	-0,020	-1,341	-0,494	-2,265
Min	0,084	-9,601	-1,054	-7,607	-1,295	-7,869	-3,118	-5,266
Std. D.	0,841	1,555	0,225	1,275	0,299	1,218	0,570	0,560
Observ.	182	182	182	182	182	182	182	182

The table is created by author's own assessment.

Table 4.2 displays the descriptive statistics of the data for both dependent and independent variables. Please note that the Table 4.2 represents the logarithmic values of the variables in the line with the definitions in the Table 4.1.

4.2. Evolution of Regional Inequalities and Convergence

Relative Regional Per Capita GDP Income Distribution

As mentioned in chapter 3, the evolution of the regional inequalities in Turkey is mostly affected by a number of economic circumstances and, therefore, evolved as a serious cohesion problem. To investigate further this evolution, we analyze in this part the tendency of overall spatial income inequalities. Besides that several spatial divisions like East/West and Interior/Coast are also analyzed. The log of real GDP per capita between 1975 and 2000 (at constant prices 1987), and log of real GVA per capita

between 2004 and 2011 were adopted for NUTS I, NUTS II and NUTS III level regions as long as the data is available. To start with the regional distribution of income, Figures 4.1 - 4.3 illustrate the regional relative incomes in different years and respectively for NUTS-I, NUTSII and NUTSIII regions. Relative income has been calculated in a way that each regional income per capita is divided into the national one. Hence, it takes value 1 if the region has just an average income and wealthier (poorer) if the value is above (below) 1.

To start with the analysis at NUTS-I level, at a glance (in 4.1), 4 maps for each decade are observed. The first one regards the year 1980. The relative income ranges between 0.45 and 1.96; hence the richest region is more than 4 times wealthier than the poorest one, indicating the severity of inequality problem. Regions around Marmara Sea are the richest regions, and the regions on the coast of Mediterranean, Aegean sea and the region TR5 that is in the interior western part of Anatolia are the second and Eastern central Anatolian regions and Eastern regions of Turkey appear to be the least developed ones. In 1990, relative income ranges between 0.37 and 1.78, in 2000; it ranges between 0.34 and 1.70. In 2010, finally, the range is between 0.57 and 1.64. So, one may argue that throughout the years, the range of incomes tend to narrow and it, thus, indicates the reduction of inequalities and homogenization of territorial prosperity.

With regard to the spatial patterns of income, relative position of regions remain almost the same; such that Marmara and West Coast of the country seem always to be the most prosperous areas, while central Anatolia and Mediterranean Regions are the followers. In addition, Eastern and South Eastern regions are the least developed ones. Hence, an East/West dualism is clearly observed and this is one of the major finding of this literature.
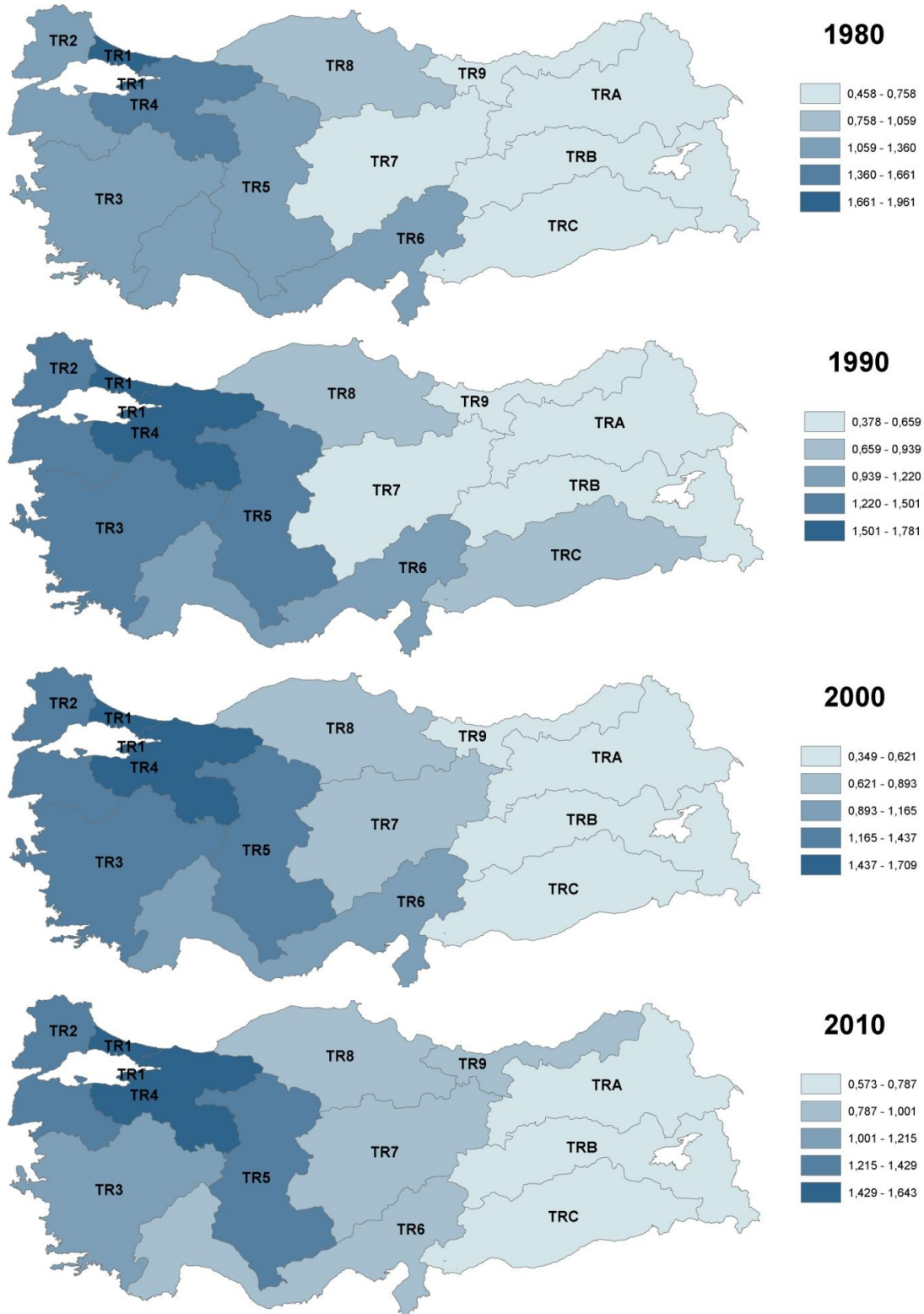
Figure 4.1. Distribution of relative income in Turkey (Real GDP and GVA, NUTS I)

In any case, a strong and positive spatial correlation is visually observed. In other words, income is not randomly distributed within the country but rather it follows a distinct spatial pattern; in which high income places are spatially concentrated in certain areas while low income regions are accumulated in other parts. For more detailed analyses the NUTS II level distribution of the GDP and GVA per capita examined in a same vein.

With regard to the geographical pattern of inequalities, 4.2 presents four maps illustrating the distribution of relative income in 1980, 1990, 2000 and 2010 for NUTS II regions. The decline of inequalities can also be observed from these maps. Such that while in 1980, relative income ranges between 0.35 and 2.01 in 1990, it ranges between 0.28 and 1.88; in 2000, between 0.27 and 2.00 and in 2010; between 0.47 and 1.7. Hence, once more the decline in income disparities is observed through the years.

The distribution of the regional income is spatially concentrated. Western regions like TR10, TR42 and TR31 are the most developed regions. In addition to the east-west spatial division, a coast-interior spatial pattern of regional income distribution also emerged.

The differences in income level across the regions have a tendency to decrease from 1980 to 1990 and then it turned to an increasing pattern. In 1990, relative income ranges between 0.28 and 1.88 (assuming average income=1), in 2000, it ranges between 0.27 and 2.00. Figure 4.2 obviously shows the spillover of income from western part of the Turkey to the eastern part.

The richest regions are still TR10 and TR42 in Marmara region, and TR31 in Aegean region. TR32, TR41, TR51 and TR62 jumped an upper level. High level income interval covered further regions in eastern part of Turkey compared to the 1980. Eastern regions have the lowest level of regional income per capita. In 2010, relative income ranges between 0.47 and 1.70. The differences between the NUTS II regions tend to decline.
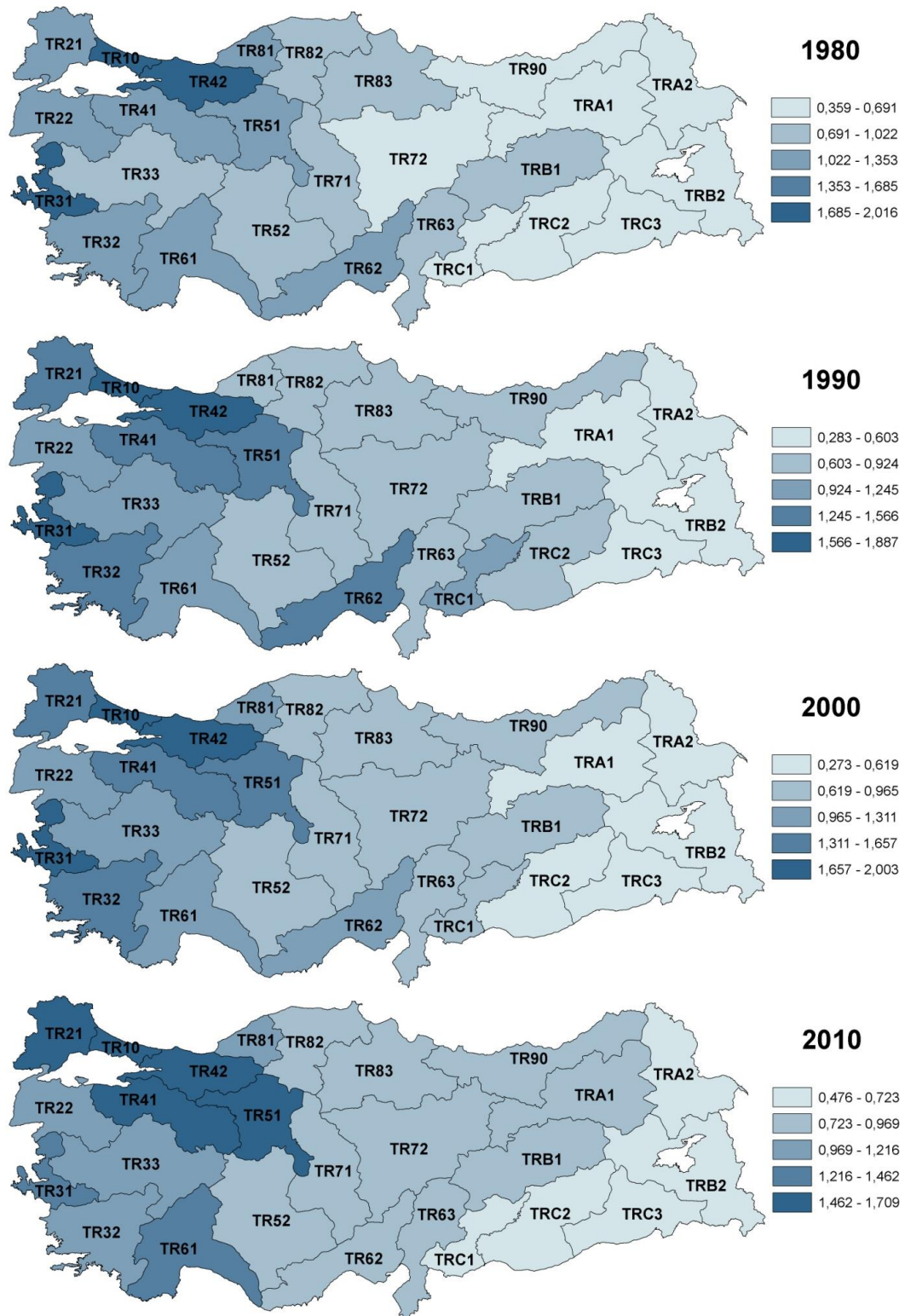
Figure 4.2. Distribution of relative income in Turkey (Real GDP and GVA, NUTS II)

The distribution of the relative regional income analyses have also been done for NUTS III regions. Due to the lack of data after the 2000s, the analyses can only be

implemented until 2000. So, Figure 4.3 illustrates the relative income distribution across NUTS-III regions in which east/west dualism is quite clearly observed.
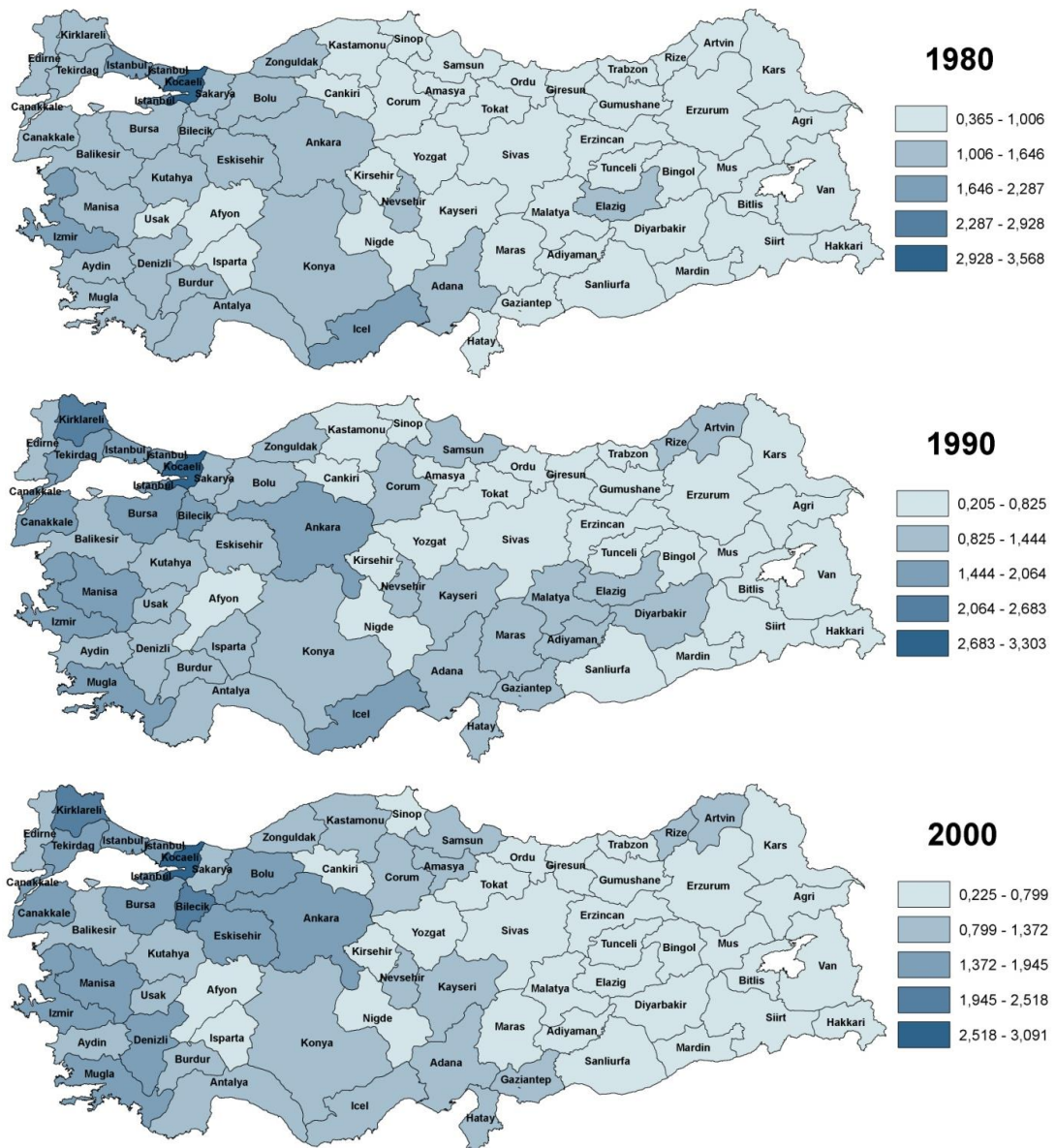
Figure 4.3. Distribution of relative income in Turkey (Real GDP and GVA, NUTS III)

In 1980, relative income ranges between 0.36 and 3.56 (assuming average income=1), in 1990, it ranges between 0.20 and 3.30. The differences regarding the NUTS III level income distribution declined. TR 421 (Kocaeli) has the highest level of relative regional income. Most of the Western regions are in the second regional income interval. Almost the entire Eastern regions are in the last and lowest level regional income interval. The division of the East and West regarding the distribution of the

regional income is quite obvious. In 1990, relative income ranges between 0.20 and 3.3; in 2000, it ranges between 0.22 and 3.09, indicating no convergence or divergence but the persistence of the inequalities.

If one should make a comparison between income inequalities in different scales, in 2000 (as a common year of analysis), the relative incomes range between 0.3 and 1.7 across NUTS-I regions; it ranges between 0.27 and 2 across NUTS-II regions and between 0.22 and 3 across NUTS-III regions. Hence, largest disparities are observed at the provincial level.

Overall, from the analyses in this part, we learn several facts on regional disparities in Turkey. First, from 1980s to 2010; relative incomes display a tendency to homogenize as they range in a narrower interval which indicates a decline in disparities. Second, although the tendency towards convergence is observed, the level of regional income inequalities is still huge; the richest regions are almost 4-5 times wealthier than the poorest ones. Compared to US and European economies, these values indicate the severity of territorial inequality problem in Turkey.

Finally, from a spatial perspective, we apply Moran's I scatter plots, which provide a tool for visual exploration of spatial autocorrelation (Anselin 1996, 2002), are done for all the dependent and explanatory variables both for 2004 and 2010. The X axis shows the income of the regions where Y-axis represents the neighboring regions' incomes. Spatial weights matrices (W2, W4, W6, W8) are calculated in a way that for instance, the closest (two, four, six and eight) neighboring regions that takes on value 1, others 0 and construct an adjacency matrix in this way. This matrix is called as *W2*, and the ones with more than 2 neighbors respectively *W4, W6* and *W8*to each other, they are accepted as neighbors. Global Moran's I statistic expressed as (Rey and Montouri, 1999):

$$I_t = \left(\frac{n}{s_o}\right) \frac{\sum_{i=1}^{n} \sum_{j=1}^{n} w_{ij} x_{i,t} x_{j,t}}{\sum_{i=1}^{n} \sum_{j=1}^{n} x_{i,t} x_{j,t}} \qquad (6)$$

where i and j are regions, w_{ij} is a raw standardized spatial weights matrix, w_{ij} denotes 1 if regions i and j are neighbor, and 0 otherwise. $x_{i,t}$ is the log of real per capita income in year t. n is the number of regions, and s_o is sum of all w_{ij} (Rey and Montouri, 1999). In Figure 4.4, the scatter plots of Moran's I for GVA per capita clearly reveals the spatial autocorrelation across the NUTS II regions of Turkey which is significant at %1 level.

The spatial autocorrelation of the GVA per capita is further specialized and clustered from 2004 to 2010 in other words; it is more spatial dependent in 2010 than it is in 2004. Besides that, the east and west division of the regional income unbalances can be clearly observed from the graphs.
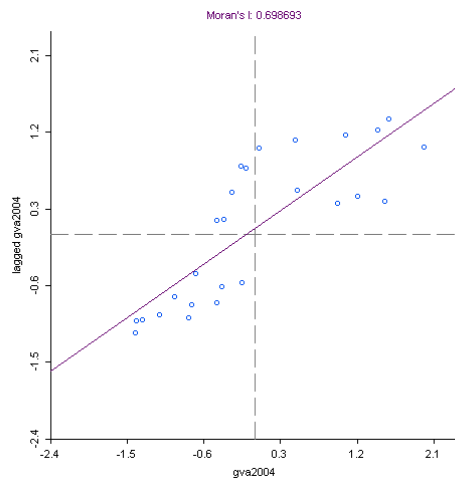
Moran's Index:	0.698693
Expected Index:	-0.040000
Variance:	0.014620
z-score:	6.109215
p-value:	0.001000
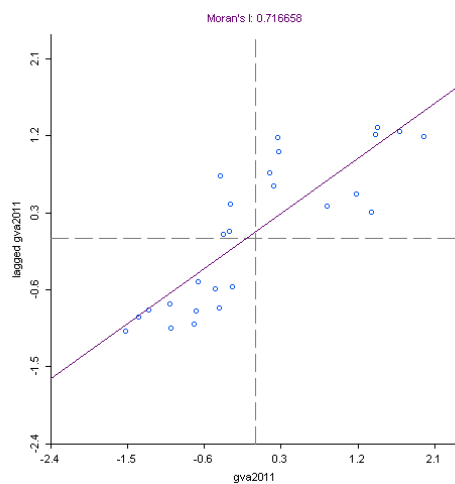
Moran's Index:	0.716658
Expected Index:	-0.040000
Variance:	0.014579
z-score:	6.266693
p-value:	0.002000

Figure 4.4. Global Moran's I Spatial Autocorrelation scatter plots for GVA per capital 2004 and 2011

Additionally, we analyzed the growth volume of the regions between 2004-2011. Table 4.3 clearly displays the growth volume of the regions, and it ranges between 0.01 and 0.17. Some regions have closeness tendencies which can be interpret as the existence of the growth clubs. Two clubs appear regarding the growth volume of the regions. The first club consists of the regions like TR82, TR32, TR81, TR51, TR61, TR10, TR41, TR31, TR62, TR42, TR72, and TR52; they all grow less slowly than the rest of the regions, surprisingly almost all these regions are from the Western Regions. The second club covers the regions which have a high speed growth and within a range

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between the 0.05, 0.17. They are mostly the regions from Central Anatolia and East of the Turkey. Such regions are TRC2, TR90, TRC1, TR21, TR71, TRB2, TR63, TR83, TR22, TRB1, TRA1, TRA2, TR33, and TRC3, respectively in an increasing order.

Table 4.3. Growth of the NUTS II Regions 2004-2011

Regions	Growth
TR10	0.033
TR21	0.058
TR22	0.064
TR31	0.035
TR32	0.020
TR33	0.080
TR41	0.035
TR42	0.041
TR51	0.026
TR52	0.049
TR61	0.029
TR62	0.038
TR63	0.061
TR71	0.059
TR72	0.042
TR81	0.026
TR82	0.016
TR83	0.061
TR90	0.055
TRA1	0.069
TRA2	0.071
TRB1	0.066
TRB2	0.059
TRC1	0.056
TRC2	0.049
TRC3	0.172
Minimum	0.016
Maximum	0.172
Mean	0.053
SD	0.029

If the second club investigated watchfully, it is quite apparent that Eastern and Central Anatolian regions grow more than the Western regions like TR10, TR51 and TR31 which confirms the decreasing trend of regional disparities across the regions of Turkey. It is, thus, amazing is that the regions that are surrounding the TR10, TR51 and TR31 are the members of the second club. Therefore these regions surpassed the TR10, TR51 and TR31. Additionally, regions like the TR22, TR21 and TR42 are the neighbors

of TR10, and such results verify and in an accordance with the existence of industrial diffusion from TR10 to its neighbors (in Figure 4.5).
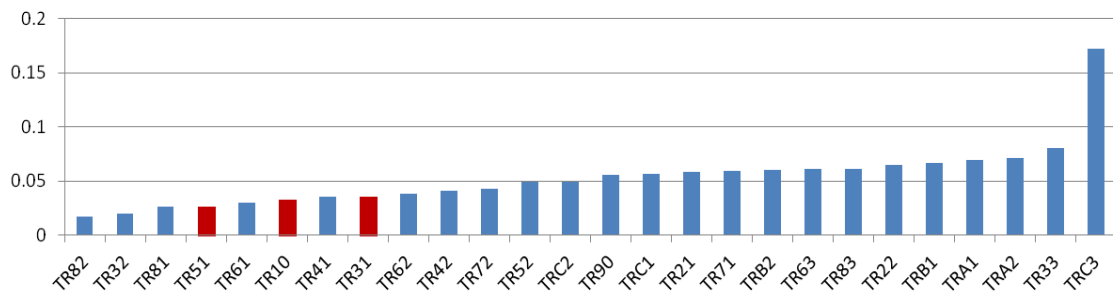
Figure 4.5. Growth of the NUTS II Regions 2004-2011

We analyzed the spatial distribution patterns of growth between 2004 and 2011 with Univariate Local Moran's I analysis in order to illustrate growth's region specific spatial interaction and concentration. Local spatial autocorrelation (LISA) test indicates that the spatial distribution of growth is not dispersed across the regions randomly, but it is concentrated geographically.
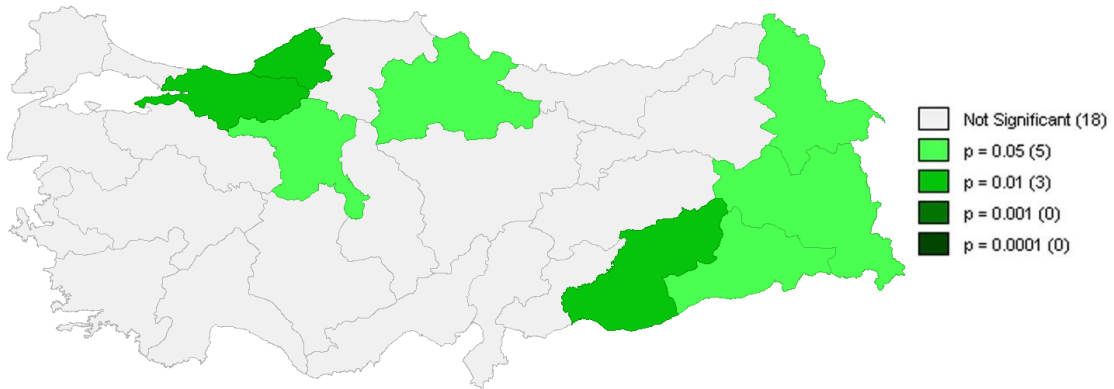
Figure 4.6. Local Moran's I Significance Tests

The significance map of Local Morans'I (in Figure 4.6) indicates several spatial concentrations according to their significance in differing shades of green. The cluster map, in Figure 4.7, shows the significant spatial autocorrelations in accordance, and as a complement to the significance map under four groups. The High-High means that "high growth regions are surrounded by high growth neighbors", Low-Low means that "low values surrounded by low values", Low-High means that "low values surrounded

by high values" and High-Low means "high values surrounded by low values" (Anselin, 1988).

The significance map reveals that the regions TR42, TR81, the TRA2, and TRB2 are significant at the %1, and the regions TR82, TR51, TR83, TRA2, and TRC3 are significant at %5 level. Additionally, the TR42, TR81, TR82 and TR51 are the regions both constitute the Low-Low cluster and surrounded by the regions that have low level growth. While the regions TRA2 and TRB2 are constitute High-High club and they are also surrounded by the highly growing regions. The rest of the regions have no significance regarding the spatial distribution and concentration of the growth. The maps obviously show that the highly growing regions are concentrated on eastern part of Turkey, whereas the low club is in the western part, so, the overall spatial inequality is decreasing.
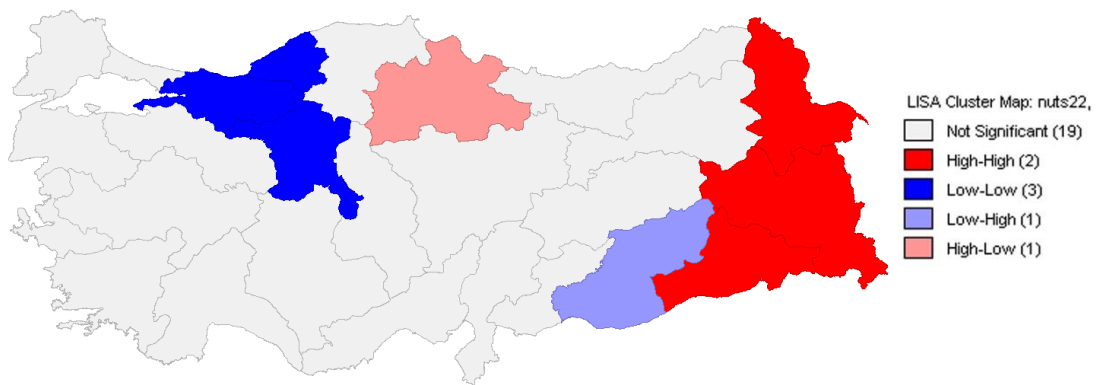
Figure 4.7. Local Moran's I Cluster Test

Inequality in Other Variables

In addition to the analysis we have so far done for the distribution of the regional incomes, inequalities in other socio-economic variables like education quality, human capital, electricity consumption, infrastructure, population and investments should also examined. Specifically, we provide in this part the distribution and evolution of these variables over time and within the country.

To start with the human capital measure, the map of distribution of the regional education services quality (measured by the student/teacher ratio) is depicted in Figure 4.8 for years 2005 and 2010.

In 2005, this ratio ranges between 12.00 and 25.00. The regions that have the highest student/teacher ratio concentrated around Eastern and South Eastern parts,

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indicating the low level of education quality. The regions around Aegean Sea and around TR51 (Ankara) seem to have lowest ratio, indicating a high quality of education services.
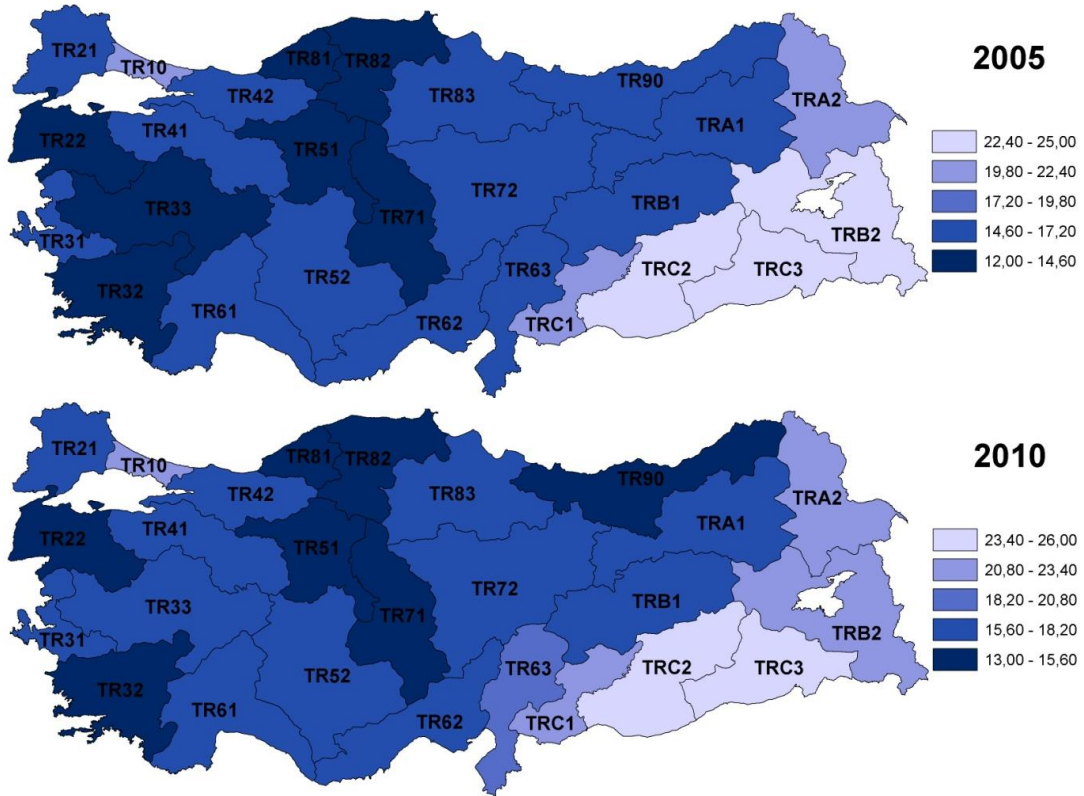
Figure 4.8. Distribution of Human Capital (measured by students/teacher ratio)
in Turkey

In 2010, the picture is almost the same as in 2005. Similar to what we have observed, student/teacher ratio ranges between 26 and 15. Still, South Eastern and Eastern parts have the highest ratio; indicating a lack of education services quality, whereas West Coastal regions and regions around Ankara exhibit lowest ratios, thus they have relatively better services in education (in Figure 4.8).

One interesting observation is that from 2005 to 2010; we do not observe any tendency to homogenization or dispersion of education services but still there are important inequalities exist across the regions.

Human capital can be measured by various indexes in the literature. For instance, it is widely measured by the share of the university graduates in the population. The data for the "university graduates" is only available between 2008 and 2013.

In Figure 4.9, the maps clearly show that the human capital that is measured by the share of university graduate in the population is not randomly distributed but especially it is spatially correlated at the western part of Turkey. In 2008, the range for the human capital is between 0.016 and 0.11. In 2013, it ranges between 0.04 and 0.165 which indicates quite large differentials among the regions.
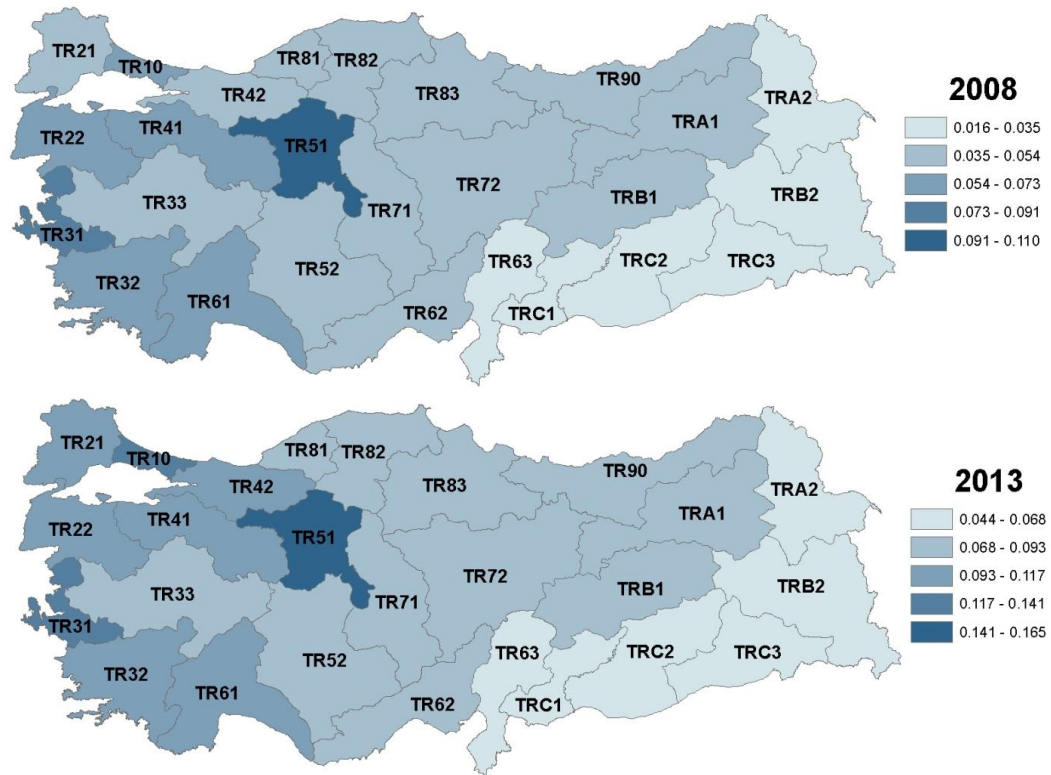
Figure 4.9. Distribution of Human Capital (measured by university
graduate/population ratio) in Turkey

Figure 4.10 provides a Moran's I scatter plot for distribution of human capital shown in Figure 4.8. The Moran's I statistics indicate a clear positive and significant spatial correlation in both years.
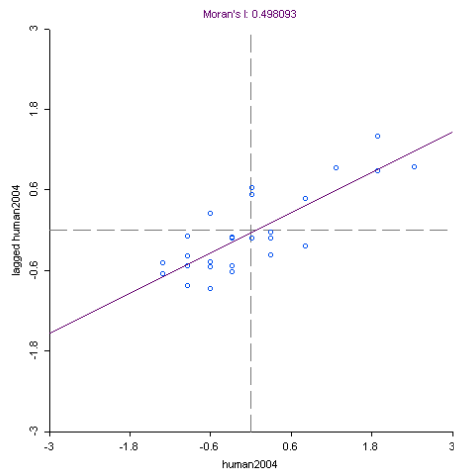
Moran's Index:	0.498093
Expected Index:	-0.040000
Variance:	0.013973
z-score:	4.552180
p-value:	0.002000
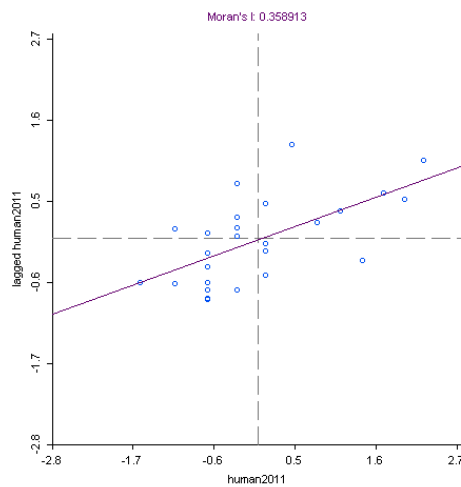
Moran's Index:	0.358913
Expected Index:	-0.040000
Variance:	0.014129
z-score:	3.356065
p-value:	0.000791

Figure 4.10. Global Moran's I Spatial Autocorrelation scatter plots for human capital 2004 and human capital 2011

Another important variable is the population (measured in logs), the distribution of which is not random across the regions but spatially correlated. Figure 4.11 illustrates the distribution of population within the space and for years 2005 and 2010. In 2005, we observe that most of the population is concentrated on the regions in Western part of the Turkey, very particularly in TR10 (Istanbul). The most crowded region (Istanbul) is 17.14 times crowded than the less populated one and the distribution range is between 0.27 and 4.63. The figure clearly displays the unbalanced distribution of the population across the regions. Eastern regions are the less populated regions.
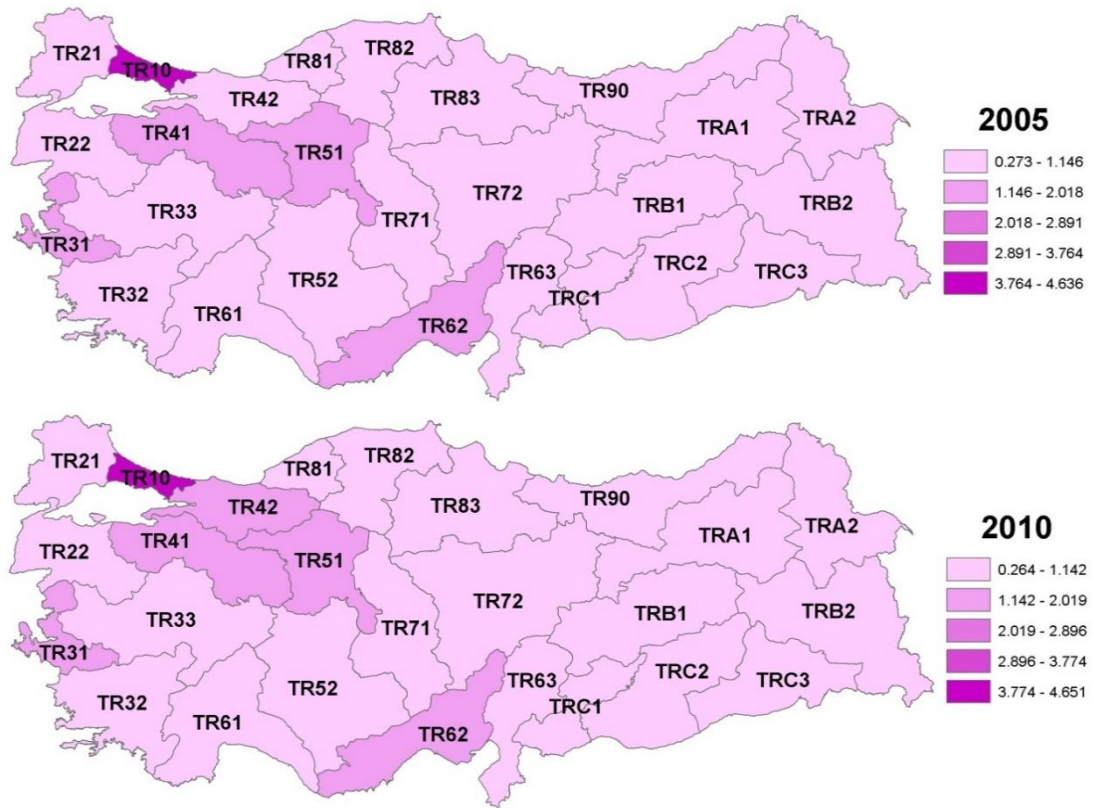
Figure 4.11. Distribution of Population in Turkey

The unbalanced distribution of the population across the regions has not changed too much in 2010. TR10 is still the most populated region and the TR42 jumped to the upper interval. The most crowded region is still 17.88 times more crowded than the less populated one and the distribution ranges between 0.26 and 4.65 in 2010.

In Figure 4.12, the Global Moran's Index for the spatial distribution of population in 2004 and 2010 is also quite high and significant at %1 level which indicates unequal and unbalanced distribution patterns across the regions of Turkey regarding the population. There is almost no change in the Moran's Index between 2004 and 2011.
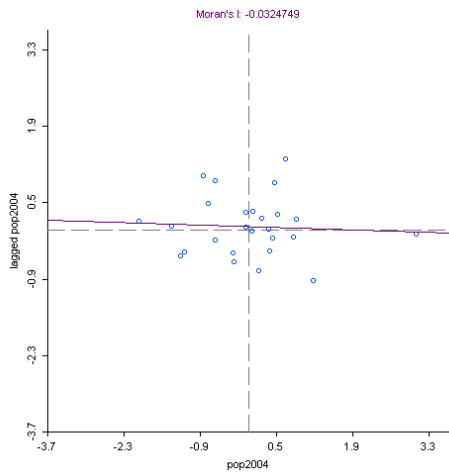
Moran's Index:	0.358913		
Expected Index:	-0.040000		
Variance:	0.014129		
z-score:	3.356065		
p-value:	0.000791		
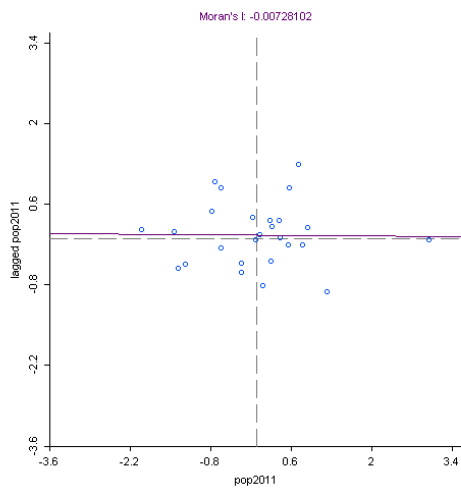
Moran's Index:	0.358913
Expected Index:	-0.040000
Variance:	0.014129
z-score:	3.356065
p-value:	0.000791

Figure 4.12. Global Moran's I Spatial Autocorrelation scatter plots for population 2004 and population 2011

As for the public investments variable, we illustrate the distribution of it in Figure 4.13. It is measured as public investments divided into regional Gross value Added. In 2005, we observe that it ranges between 0.2 and 4.2. The regions that receive most intensively these investments are Istanbul, Black Sea Coastal region and Ankara. It does not seem to follow a spatially correlated pattern. However, the inequalities are huge as the regions that receive public investments most is almost 20 times more than the least receiving one.
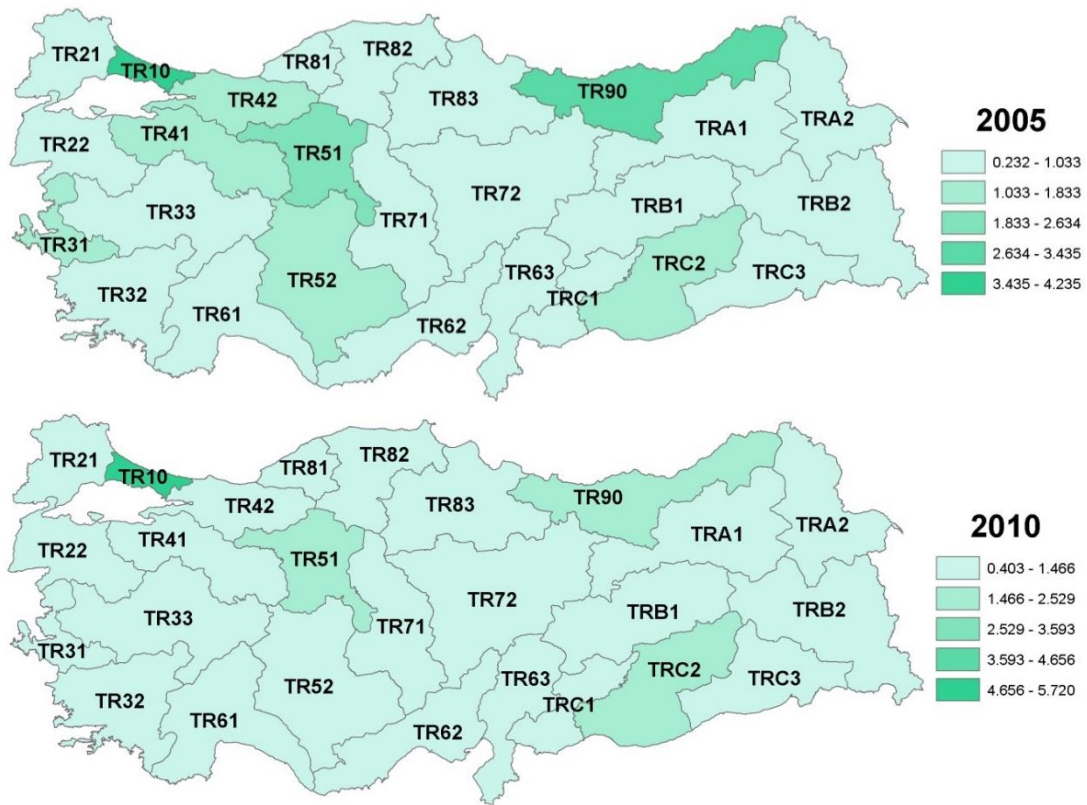
Figure 4.13. Distribution of Public Investment in Turkey

Looking at the same figure for 2010; the picture is almost the same. Geographical distributions of investments do not change much and inequalities are still quite high.

In Figure 4.14, the scatter plots for the spatial distribution of the public investment across the regions both in 2004 and 2010 indicate highly spatially correlated patterns which are significant at %1 level. The TR10, which is the global city region of Turkey, absorbed the great share of the public investment since 1970s. This is also not changed too much in 2004. TR10 has the highest share of public investment across the regions both in 2004 and 2010.
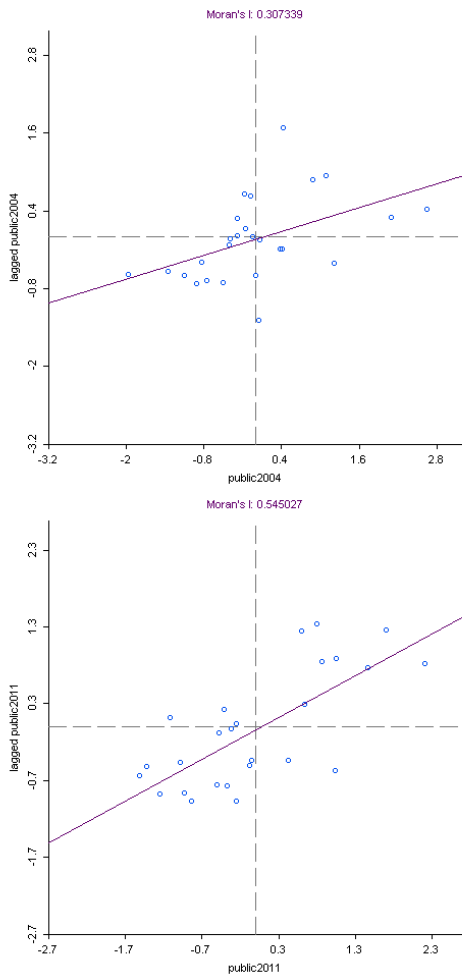
Figure 4.14. Global Moran's I Spatial Autocorrelation scatter plots for public investments 2004 and public investments 2011

One of the other important variables that could explain the regional disparities is the private capital and investments. We do not, in fact, have a direct data to measure such a variable. Thus, what we can do is only to use a proxy. Hence, we proxy it with the electricity consumption used in industrial production which might signal the amount of investments done by private firms.
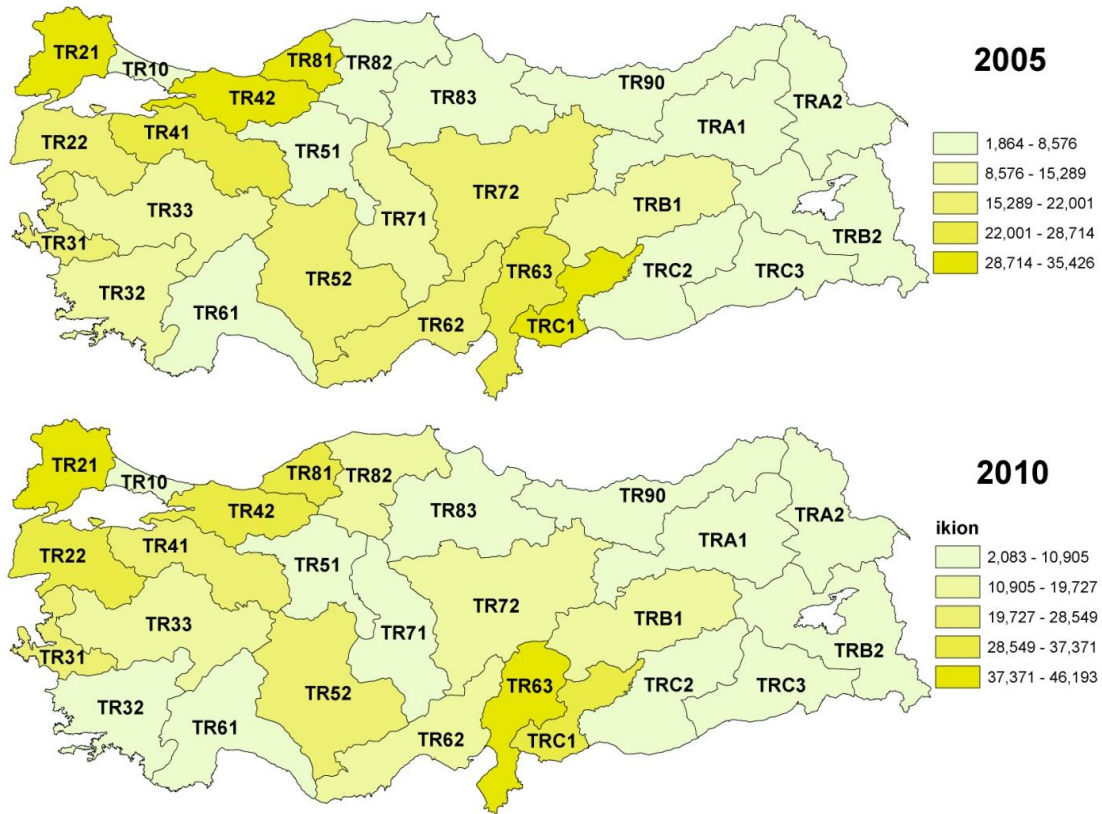
Figure 4.15. Distribution of Electricity (measured by electricity con /GVA per capita) in Turkey

In a similar vein with the distribution of human capital and regional income, the distribution of the electricity consumption has also similar spatial concentration patterns except the region TRC1. The range is between 1.86 and 35.42 in 2005; indicating huge differences in private investments. The regions TR21, TR42, TR81 and TRC1 are in the highest interval regarding regional electricity consumption. The eastern regions are in the lowest interval. Maps obviously show that the electricity consumption per capita is high where the industrial activity is concentrated. (i.e. around Marmara Region)

In 2010, the range is between the 2.08 and 46.19. The gap has increased compared to 2010. There is not too much difference between the regional distributions of the electricity consumption except the TR63 and TRC1. These two regions replaced their intervals, the TR63 jumped to the upper interval, while the TRC1 fall to the lower interval.

The gap between the highest electricity consuming and the lowest electricity consuming regions increased from 2005 to 2010. The highest consumed regions consume 22.17 times more than the lowest level region.

In Figure 4.16, the Moran's I scatter plots for electricity consumption yield significant outputs at %1 level and they are highly and spatially clustered both in 2004 and 2011. Electricity consumption is used for measuring the spatial imbalances across the regions regarding the private investments.

Moran's Index:	0.319708
Expected Index:	-0.040000
Variance:	0.014669
z-score:	2.969993
p-value:	0.005000

Moran's Index:	0.247412
Expected Index:	-0.040000
Variance:	0.014452
z-score:	2.390801
p-value:	0.016000
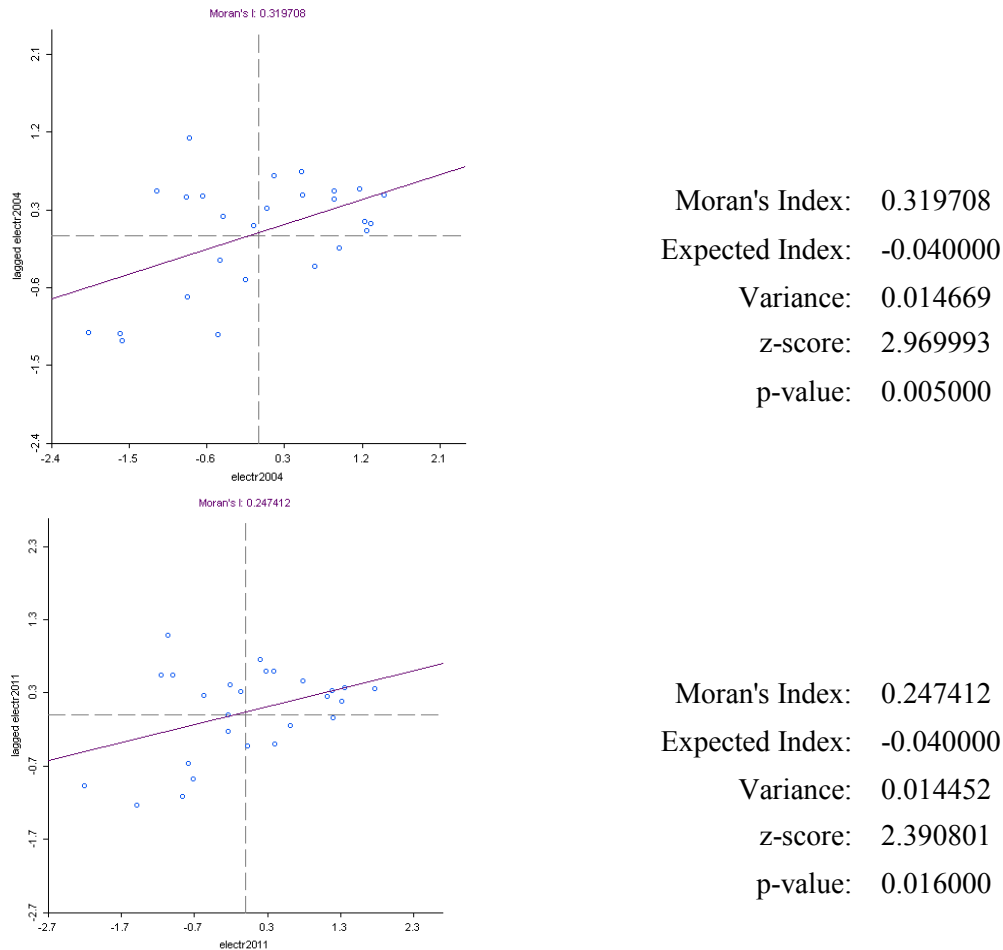
Figure 4.16. Global Moran's I Spatial Autocorrelation scatter plots for electricity 2004 and electricity 2011

Finally, the last variable regards the inequalities in infrastructure. The distribution of the infrastructure, which is measured by the highway length in a region divided into the regions area. It has been shown in maps for 2005 and 2010. It has almost same spatial attributes with the distribution of the income.

Regardless of the year shown, the high rates of the road densities are concentrated on the regions that are located in western part of Turkey. TR21, TR31, TR81 and the TR90 are the regions that are in the highest level interval. The second interval consists of the TR10, TR22, TR42 and the TR82 regions. The range is between

0.06 and 0.11 in 2005, and it is between 0.06 and 0.11 in 2010. The gap between the highest and the lowest is almost constant between 2005 and 2010.
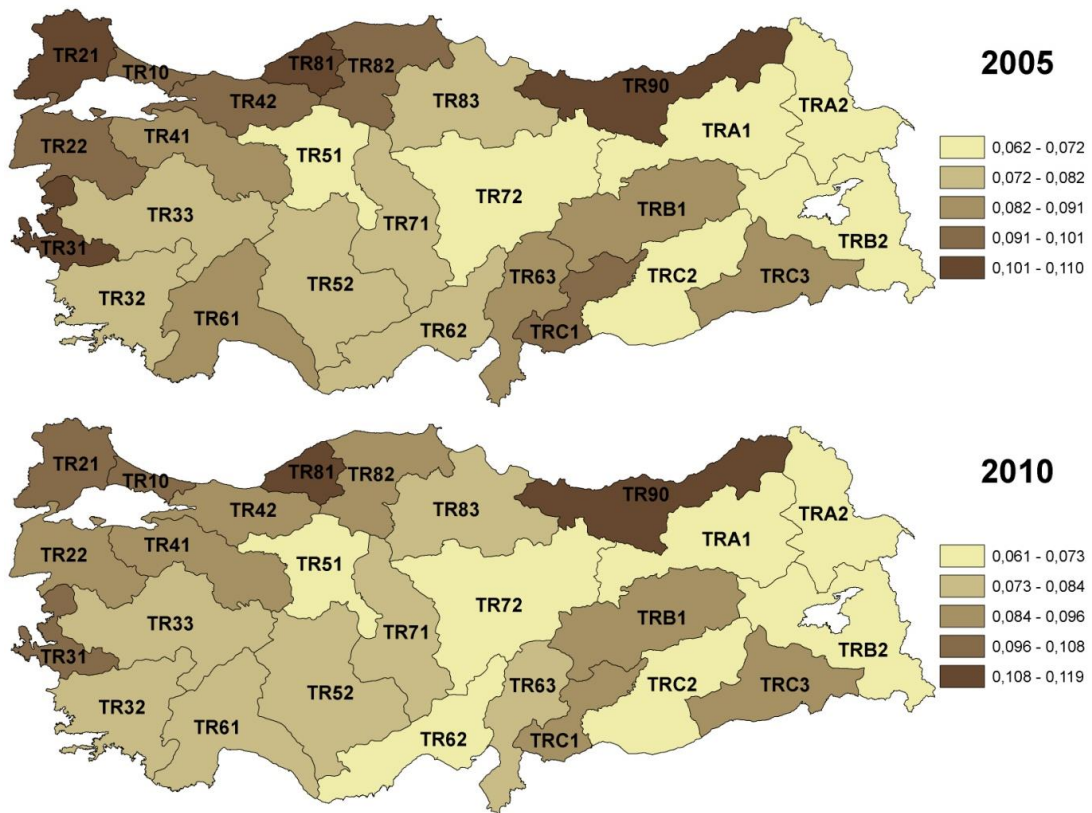
Figure 4.17. Distribution of Infrastructure (measured by road density of each region) in Turkey

In Figure 4.17, we observe that there is no spatial dependence regarding the distribution of the road density across the regions of Turkey in 2004 and 2011, and it is distributed rather randomly.
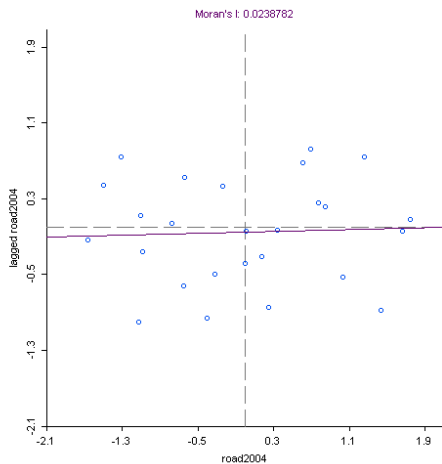
Moran's I: 0.0238782

Moran's Index:	0.023878
Expected Index:	-0.040000
Variance:	0.014695
z-score:	0.526956
p-value:	0.270000

Moran's I: 0.0210718
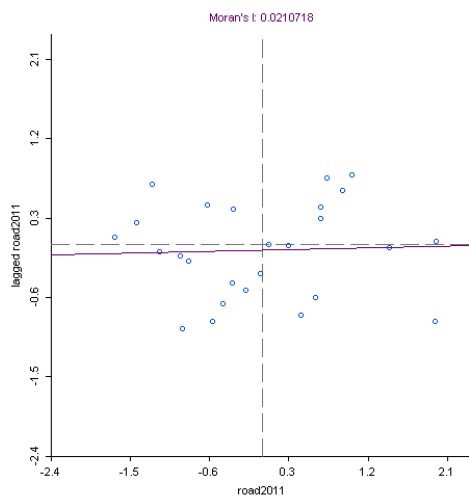
Moran's Index:	0.021072
Expected Index:	-0.040000
Variance:	0.014468
z-score:	0.507729
p-value:	0.307000

Figure 4.18. Global Moran's I Spatial Autocorrelation scatter plots for road density 2004 and road density 2011

Another variable that can signal the regional inequalities in infrastructure is the number of telephone subscriptions per person which is shown in Figure 4.18. An East/West dualism is clearly observed in infrastructures.
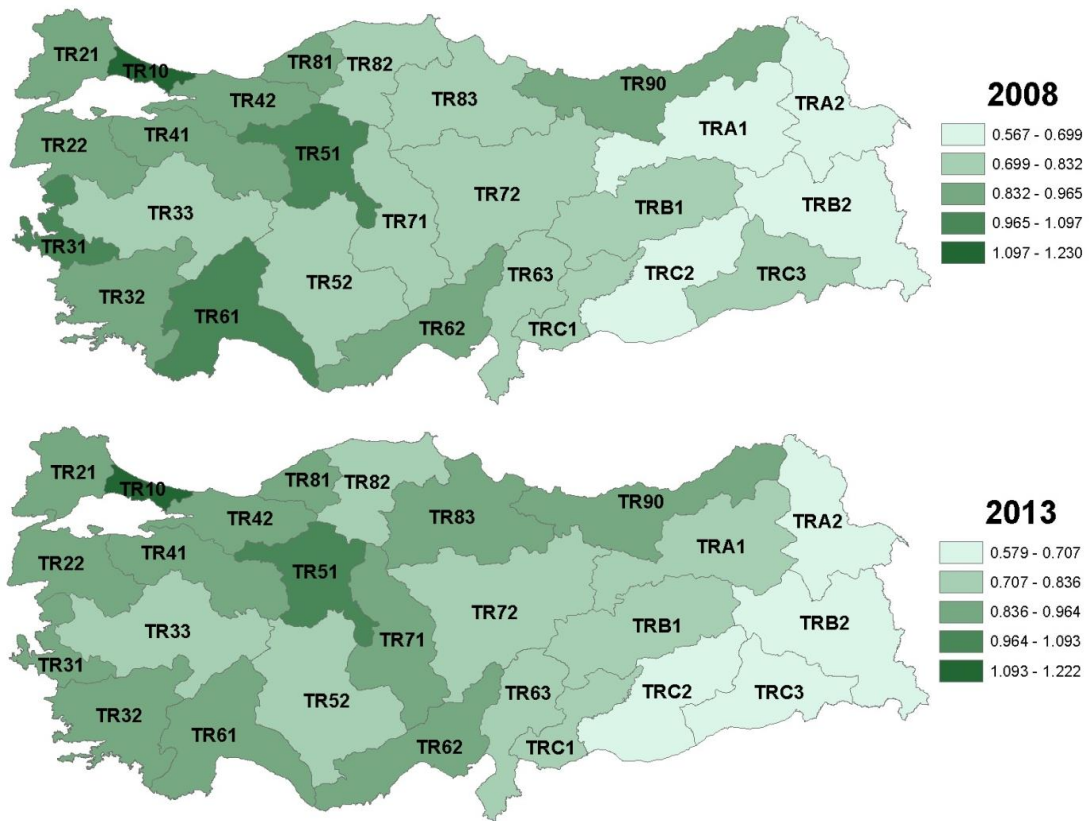
Figure 4.19. Distribution of Infrastructure (measured by the number of mobile
telephony subscriptions/population) in Turkey

Overall, this part has shown that not only inequalities in income matter for regional economies, but other socio-economic and infrastructural aspects are also quite important and there are large disparities across regions in these variables. In addition, these variables are termed control variables which will be used in explaining convergence/divergence patterns in regression analysis

Sigma Convergence Analyses with Per Capita income

The present section is devoted to analyzing the sigma-convergence and evolution of income inequalities among regional incomes in Turkey. The period we consider runs from 1975 to 2011 with the exception of 2001-2004 period since there exists no published income data for that years.

To pursue such an analysis, we use three most commonly adopted statistical indices *(CV, WCV, Theil)* (Anselin, 1988) and a unit-root test which helps examining the presence of significant decline/increase in inequality indices. With regard to the spatial

units, to be able to as general as possible, we implement the analysis for both NUTS-I, NUTS II and NUTSIII regions and with possible divisions of East/West or Coast/Interior (Appendix C).

In terms of income data, per capita real GDP (at 1987 prices) is used for the period of 1975-2000 and per capita real GVA (Gross Value Added) (at 2003 prices) for the period of 2004-2011. The reason why we use different variables is totally due to lack of available GDP data for the recent period. So, in this case, GVA is seen as best available proxy to GDP

Before showing our results, we need to define the inequality indices. The first inequality index is the Coefficient of Variation (CV):

$$CV = \frac{\sqrt{\sum_{i=1}^{n} \frac{(y_{i,t} - \bar{y}_t)^2}{n-1}}}{\bar{y}_t} \tag{7}$$

where $y_{i,t}$ is the per capita income in region i at time t and $\bar{y}_t$ is its cross sectional mean. *n* is the number of regions. Greater values of CV indicate larger inequalities and more dispersed distribution of income across regions.

Although CV is commonly accepted in the literature, it has been criticized by researchers since it does not take into account the differences in population sizes of regions. In other words, it treats all observations equally (Petrakos and Artelaris 2009, Petrakos et al. 2005). This creates a caveat also for this study since the population of regions is greatly heterogeneous. Such that population of Istanbul region (TR10), which is about 13 million, is 18 times bigger than the population of TR82 (Kastamonu, Çankırı, Sinop) region which has population about 740.000 inhabitants. For these reasons, it useful to calculate also a population weighted coefficient of variation (WCV):

$$WCV = \frac{\sqrt{\sum_{i=1}^{n} (y_{i,t} - \bar{y}_t)^2 * (p_{i,t})}}{\bar{y}_t} \tag{8}$$

where $p_{i,t}$ represents the population share of region i in national population at time t. Lastly, an inequality index developed by Theil (1967) is calculated which is used by Yildirim et al. (2009) in their application to Turkish regions:

$$\text{Theil} = \sum_{i=1}^{n} \log(s_{i,t}/p_{i,t}) * (s_{i,t}) \qquad (9)$$

where $s_{i,t}$ denotes region i's share in national income.

Figure 4.20 displays the calculated indices for NUTS-II level regions. At a glance, two important results appear to emerge: First, a clear pattern of declining inequalities is present from mid-1970s to 2011. In other words, visual inspection of indices suggests a convergence pattern among regions and, therefore, homogenization of economic prosperity. Second, although the inequalities tend to decline, its level is still quite high. Such that *WCV* is about 0.5 in the most recent period which is far above the inequality level among European regions or U.S. States.

The economic reasons behind the observed inequalities are mostly attributed to social, geographical and demographic characteristics of regions. For instance, the most prosperous regions are the places (around Marmara and Aegean Sea) in which geographically concentrated and dynamic industries are present. Moreover, relatively high level of human capital and educated workforce, better infrastructure and transport routes in these regions are among the factors that contributes to the productivity. In contrast, the underdeveloped places, which mostly specialize in traditional sectors, lack these facilities.

To support the declining trend of inequalities from an inferential point of view, two types of unit root tests are applied to the inequality indices displayed in Figure 4.20 (Augmented Dickey Fuller (ADF) and Philips-Perron (PP) tests)(Phillips and Perron, 1988). These tests examine whether indices fluctuate around a constant value or show a tendency to increase or decline over time. Such that the hypothesis takes the following form:

Ho: No unit root; the variable increase or decrease over time (non-stationary process)

Ha: Unit Root; variable has a mean reversion (stationary process)

The results are summarized in Table 4.4. For all indices, the test statistics is not statistically significant. This actually means the null hypothesis of no unit root cannot be rejected. Thus, the regional inequalities do not follow a stationary process; in contrast, they have a significant downward trend over time which indicates evidence in favor of an economic convergence.

Table 4.4. Unit Root Tests for σ-convergence

Variable	ADF	PP
CV	-0.46	-0.37
(P-value)	(0.89)	(0.90)
WCV	0.10	-1.90
(P- value)	(0.96)	(0.33)
Theil	-1.41	-1.38
(P- value)	(0.56)	(0.58)
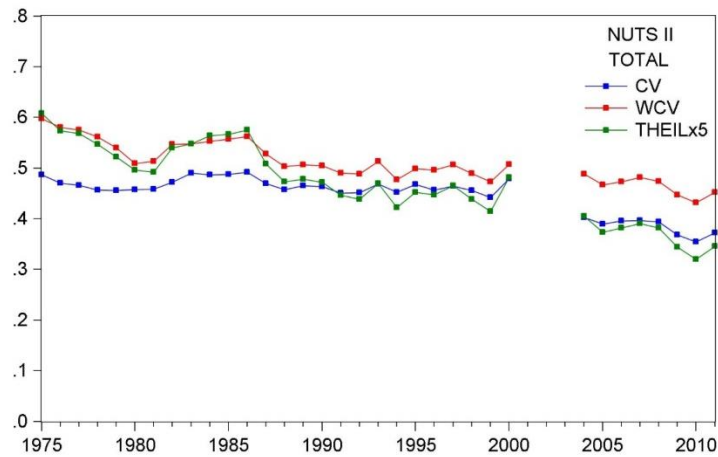
Figure 4.20. Regional Income Inequality Indices across NUTS II Regions GDP and
GVA per capita

The same indices have been calculated separately for East and Western region.
The results are depicted in Figure 4.21. There is a slightly declining trend of inequalities
across the eastern regions of Turkey. It declines from around 0.5 to around 0.4 between
the period between 1975 and 2010. But the gap across the eastern regions is still quite
high. However all indices draw declining trend; WCV draw higher level regional
inequality results across the eastern regions than the other two indices.
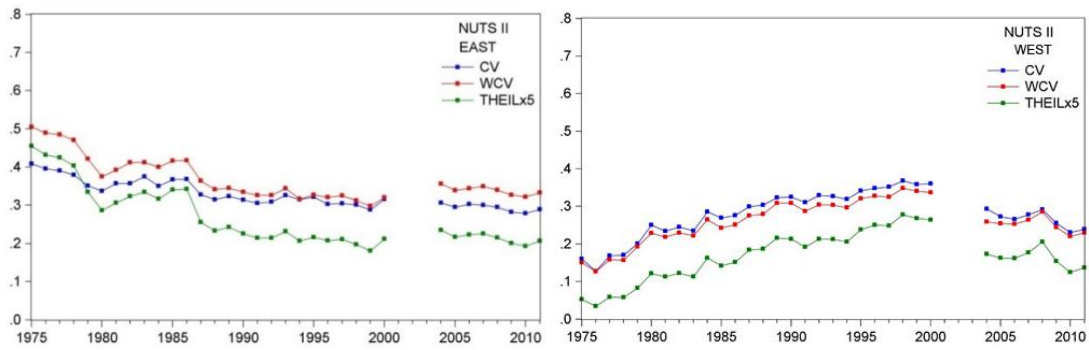
Figure 4.21. Regional income inequality indices across Eastern and Western NUTS II regions GDP and GVA per capita

On the other hand, income inequalities across the western regions display a divergence trend until 2000, but then regional inequities turns to decrease after 2004 in Figure 4.21. It is not wrong to suggest that the regional inequalities across the western regions remain almost constant over the period of 1975-2010. In any case, comparing the level of inequalities within the West and East part, western regions display a more homogenous pattern of income among each other.
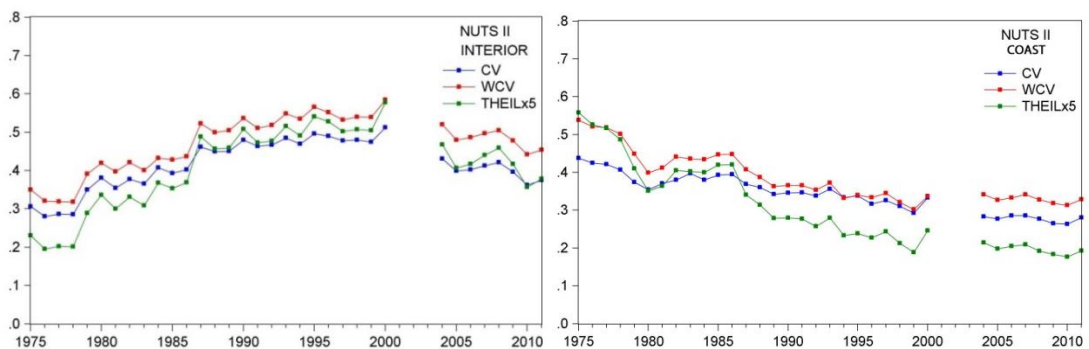
Figure 4.22. Regional income inequality indices across Interior and Coastal NUTS II regions GDP and GVA per capita

In addition to the east/west division of the regions, same analyses are done for coastal and interior division. Figure 4.22 clearly shows that regional inequalities across the regions located in the coastal part of the Turkey have a declining pattern for the period of 1975-2010, while the regional disparities are increasing across the interior regions for the period of 1975-2002 and then declining after 2004. Yet, the overall regional inequalities across the interior regions are increased.

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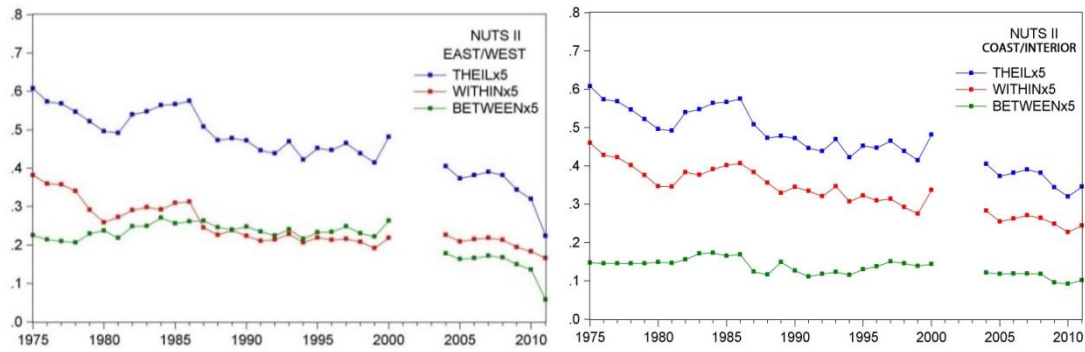
Figure 4.23. Decomposition of the Theil indices Interior - Coast and East - West
            NUTS II regions GDP and GVA per capita

The indices we so far presented do not indicate the inequality between East/West or Coast/Interior divisions. To do this, we calculate the average per capita incomes of all divisions and demonstrate the relative incomes. Figure 4.24 for instance shows the relative incomes; interior regional income divided into coastal income and Eastern regional income divided into Western.
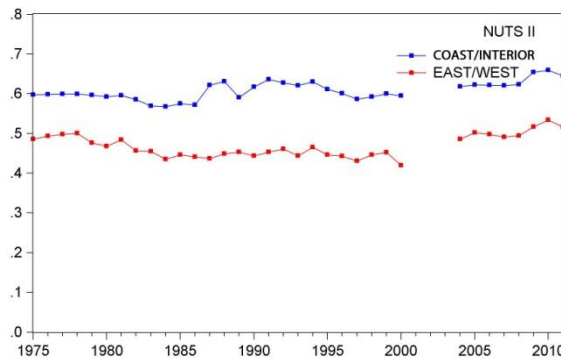
Figure 4.24. Regional income inequality indices between East - West and Interior –
            Coast NUTS II regions GDP and GVA per capita

Our first observation is that the rate of regional inequality between the East and West is higher than the inequality between the coastal and interior. The gap between the interior and coastal part of Turkey is slightly fluctuating, but it is almost constant between the 1975 and 2010. A slightly increasing pattern exist in the regional inequalities between the east and west part of Turkey for the period of 1975 – 2002, then the trend turns to a slightly decreasing pattern between the 2004 and 2010.

Thus, our analyses in the part give consistent results with the maps in previous parts. So, we have shown once more that inequality level across regions is still quite

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high although a tendency to decline in inequalities is observed. Eastern regions include a higher inequality between each other compared to Western ones. Furthermore, East/West dualism tends to decline slightly; interior/coast differences remain constant over time.

All these analyses are done for NUTS-I and NUTS-III regions as well. However, to save space, the results are presented in Appendix C. They give more or less same and consistent results with NUTS-II level analyses.

Relative Regional per Worker GVA Income Distribution

Per capita GDP analysis we have so far implemented might provide shortcomings as it only considers per person prosperity and do not say anything about productivity of labor. So, in this sub-section, we present the same type of analysis using real GVA per labor. According to the report of the OECD, the regional differences measured by the GDP per worker were markedly high in Turkey and Mexico and differences in these countries are almost four times higher than in United States in 2000 (Felsenstein and Portnov, 2005). Filiztekin (1998) reports that the regional productivity levels and growth varying across the sectors and the regions of Turkey over the period 1975-1995.

To start with, in addition to the distribution of the regional per capita GDP, the regional distribution of per worker GVA is also examined in order to compare regional differences. In Figure 4.25, we present the maps which show the distribution of relative regional income per labor at NUTS-II level (national average=1). Several interesting observations can be made.

First, East/West dualism of prosperity can still be observed although it seems less acute compared to the case of per capita income analysis. In anyways, disparities are huge. Such that in 1990; the maximum relative income is 2.073 and minimum is 0.250.So, it means that the richest place has about 18-19 times more income than the poorest one. Moreover, the income seems to have distributed in a spatially correlated fashion.
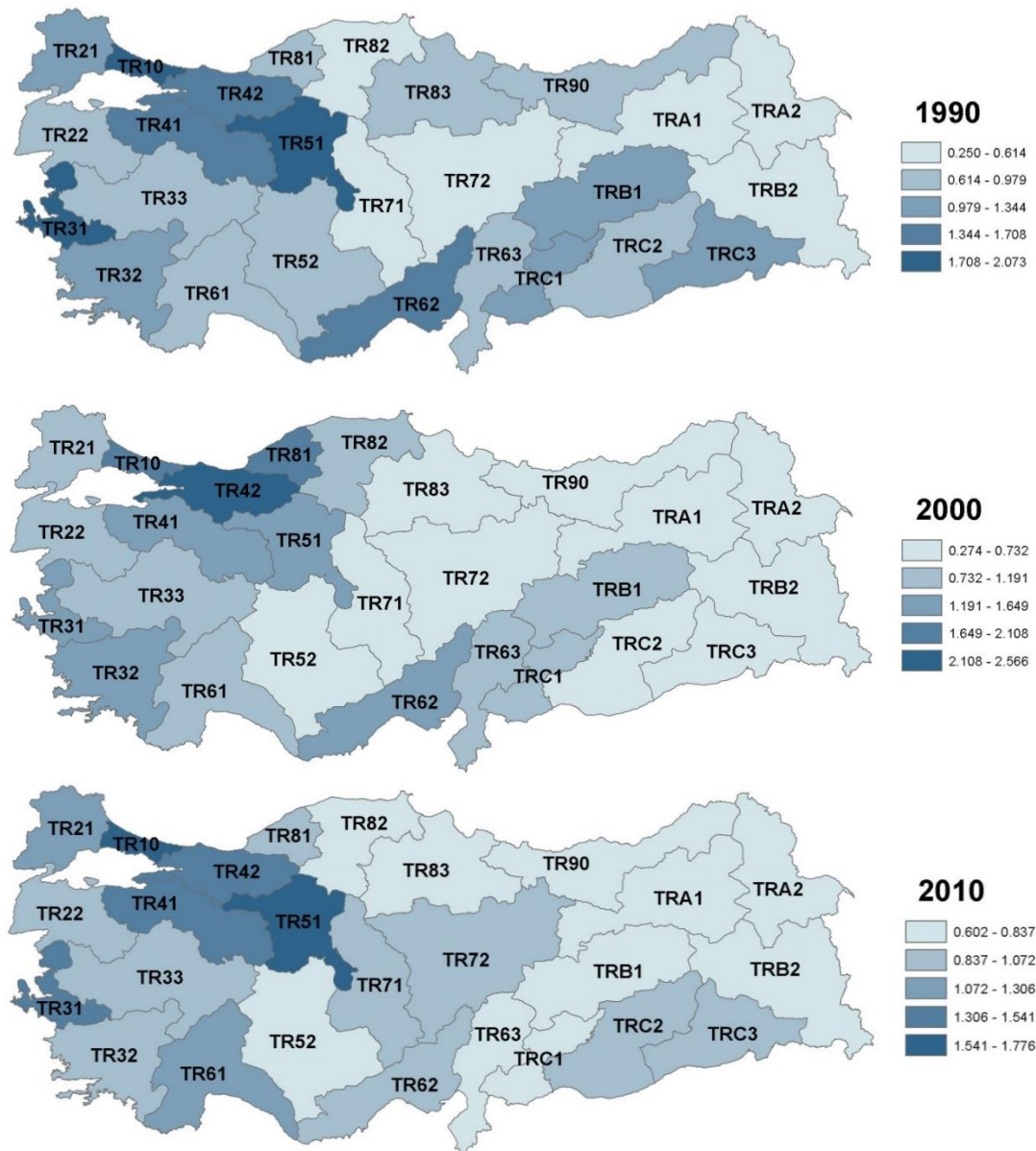
Figure 4.25. Distribution of relative income in Turkey (Real GDP per worker and
GVA per worker, NUTS II)

TR10, TR31 and TR51 have the highest level of regional distribution of per worker GVA, while the regions about the coast of Eastern Central Anatolia and the eastern Anatolia have the lowest level of per worker GVA. The figure clearly displays a correlation between the spatial distribution of the per worker income, or let's say productivity and industrial regions. The highly industrial concentrated and agglomerated regions of Turkey have the highest level productivity.

Another important result is about the evolution of disparities. The relative productivity ranges between 2.073 and 0.250 in 1990; between 0.27 and 2.5 in 2000;

between 0.6 and 1.776 in 2010. So, a small tendency to decline in the range points to a slight decline in productivity differentials.

With this regard, for the era between 2004 and 2011, the regional productivity inequalities across the regions are calculated using the former three indices.
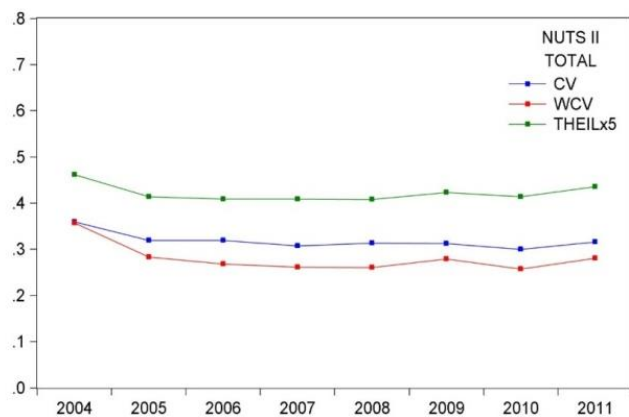
Figure 4.26. Regional income inequality indices across NUTS II regions GVA
per worker

Figure 4.26 clearly shows a persistent pattern of inequalities across the regions over a period 2004-2011. Compared to per capita analyses, however, observed inequalities are less serious in per labor analysis.(as 2011 WCV value in per capita analysis is about 0.5 and in per labor analysis it is about 0.3).
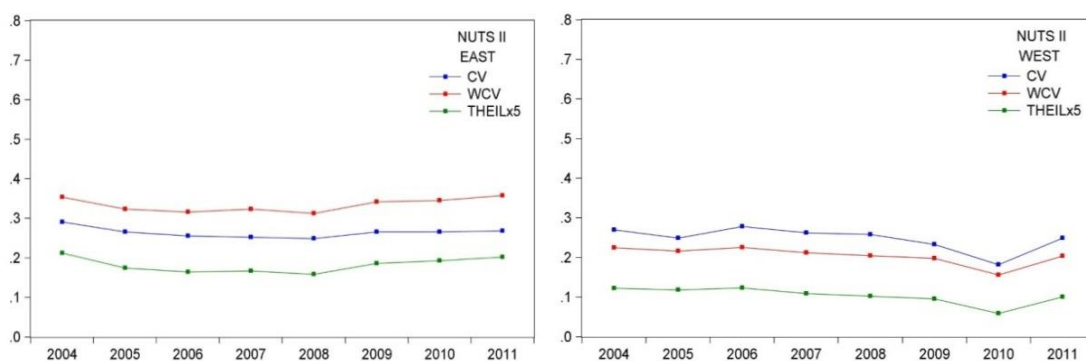
Figure 4.27. Regional income inequality indices across NUTS II East and West
regions GVA per worker

Figure 4.27 shows the inequality indices separately for Eastern and Western regions. The gaps across the eastern regions are constant and it is slightly different in the western regions that the gap across the western regions is quite slightly decreasing.

The differences in productivity level are higher across the eastern regions than across the western regions. Most of the industrial regions are concentrated on the western part of Turkey. But, there are few industrial regions are also located in the eastern part of Turkey such as TRC1, TRC3, and the rest is highly agriculture oriented regions, and this sectorial imbalances lead to an inequality regarding the productivity across the regions of east and west.

The same analysis for the coast/interior division is shown in Figure 4.28. The differences across the coastal regions are constant at 0.42 level, while the differences across the interior regions are decreasing from 0.44 to 3.7. The gaps across the coastal and interior regions are rather close to each other. This is somehow related with the distribution of the industrial activities across the regions of Turkey. The regions that are on the coast of the Aegean Sea and Marmara sea are the industrial clusters and the rest of the coastal regions are mostly concentrated on the agriculture and service sectors rather than the industrial activities. This is the main reason behind the differences across the coastal regions.
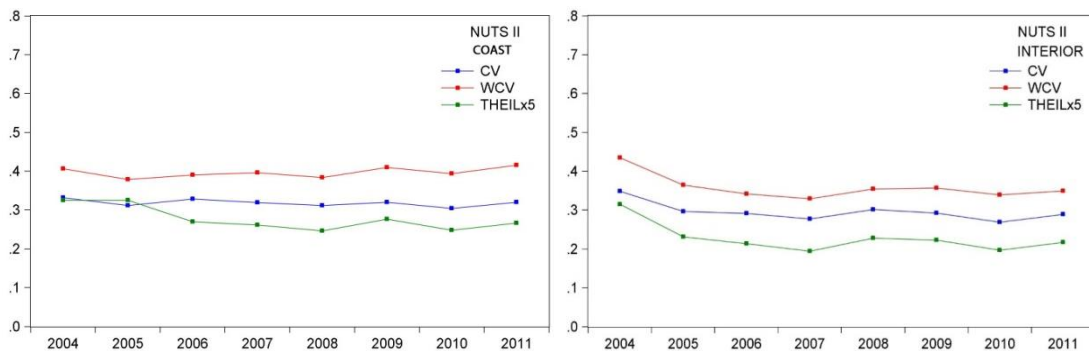
Figure 4.28. Regional income inequality indices across NUTS II Interior and Coast
          regions GVA per worker

Lastly, the trends for the inequalities across coastal /interior and Easter/West divisions of regions can be observe from the within and between decomposition of the Theil index in Figure 4.29. The inequality across the eastern regions and western regions are quite high compared to the inequality across the interior and the coastal regions. The Figure clearly displays that the difference between the interior and the coastal is quite low, however both the coastal and the interior regions have high level inequality within the groups, separately.
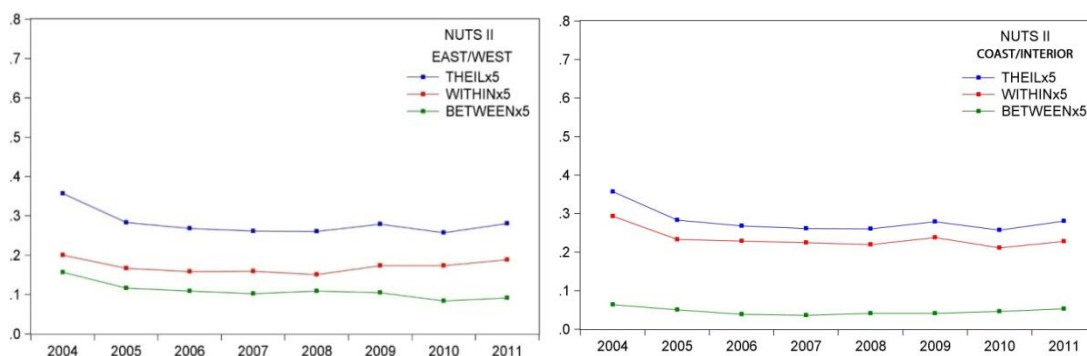
Figure 4.29. Decomposition of the Theil indices Interior - Coast and East - West
NUTS II regions GVA per worker

Overall, the message we convey in this part is actually twofold: First, Compared to per capita analyses, however, observed inequalities in productivity are less serious. Second, these inequalities are non-decreasing in contrast to per capita disparities (Appendix D).

4.3. Trade Analyses

As it is mentioned very detailed in the chapter 3, from 1970s to 2000s, Turkey has experienced several milestones in the liberalization process. First, deregulation policies and economic program following the crisis in 1980 was designed to promote export-led growth and trade openness. Import-substitution approach, which took place until that time, was instead abandoned (Boratav et al. 1999). Hence, integration to global commodity markets was achieved via trade liberalization. Exports were particularly important as the main strategy for economic growth and stability. In 1989, Turkish lira became convertible in foreign markets which contributed to the acceleration of liberalization.

A number of key international agreements have been signed over the last decades with the western and the eastern countries. As a consequence of these developments, volume of external trade has significantly risen. Figure 4.30 illustrates the evolution of export and import volumes and share of trade in GDP over time.

The trade volumes seem to follow an exponential evolution that increased sharply during 1990s and, particularly, after 2000. It is also observed that imports were always greater than exports, creating a current account deficit which has grown over

time. Trade openness shown in Figure 4.30,
to 2011, despite sharp declines during the fin
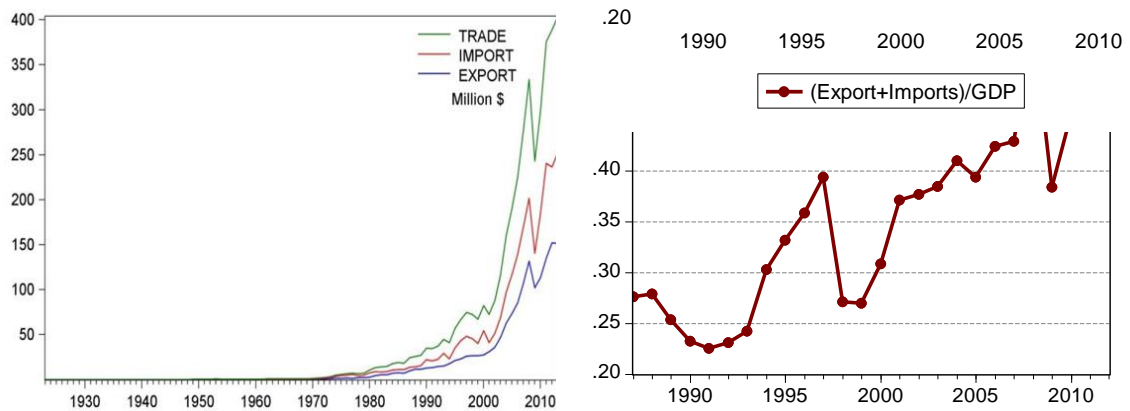
Figure 4.30. Trade liberalization of Turkish economy

The spatial distribution of the trade both for export and import on maps was not preferred because of the fact that, the TR10 is the leader region in terms of the shares of the trade both in export and import across the countries in 2004 and 2011. This fact makes displaying the distribution of trade on map not possible regarding the intervals. All regions are shown clearly in Table 4.5., the diffusions of the trade both in export and import from core regions to other regions. For instance, we observe that developed regions like TR10 has lost its share in aggregate exports. Its share has declined from 58.3 % to 45.5 %. The same patterns can also be observed for imports (share declined from 69.1 % to 60 %).

TR10 and the TR31 are the only regions that lose their trade shares both in export and import it is quite easy to follow their loss of shares by tracing the regions that have an increasing trade shares. As mentioned before, TR10 has the highest share of trade both export and import in 2005 and 2010. Yet the shares of TR10 both in export and import declined from 2004 to 2011. The export is in range between 58.03 and 45.5 in 2004, and the import is range between 69.1 and 60.0 in 2011. The second trade loser region after TR10 is TR31. The share of trade, both in export and import, in TR31 is declined from 2004 to 2011.

These declines in both export and import are shared between the regions, surprisingly; the southern eastern regions like TRB2, TRC2 and TRC3 are the regions that take the lion share from the pie. They increased their export share 4 times between

2004 and 2011. TR71, TR33, TR81 and the TR52, are the regions that increased their export share between 3 and 2 times. TRC1, TR42, TR51, TR83 and TR32 are the regions that increased their export share more than 1 times.

Table 4.5. Shares of regions in total exports or imports

Regions	Exports		Imports	
	2004	2011	2004	2011
TR10	58,3	45,5	69,1	60,0
TR21	0,7	0,6	0,5	0,5
TR22	0,4	0,4	0,2	0,3
TR31	6,5	6,0	5,3	5,1
TR32	2,4	2,7	0,7	1,3
TR33	1,2	3,5	0,6	2,0
TR41	9,0	9,3	5,9	6,2
TR42	6,9	10,8	4,6	7,0
TR51	3,5	4,9	4,5	5,8
TR52	0,5	1,0	0,5	0,6
TR61	0,9	0,9	0,5	0,4
TR62	2,1	2,3	1,7	2,0
TR63	1,4	2,1	1,1	3,2
TR71	0,1	0,3	0,1	0,2
TR72	1,1	1,1	1,0	0,9
TR81	0,2	0,5	1,1	1,0
TR82	0,1	0,1	0,0	0,0
TR83	0,3	0,5	0,4	0,6
TR90	1,6	1,5	0,3	0,1
TRA1	0,0	0,0	0,0	0,0
TRA2	0,1	0,1	0,0	0,0
TRB1	0,2	0,2	0,0	0,1
TRB2	0,0	0,3	0,0	0,0
TRC1	2,1	3,6	1,6	2,4
TRC2	0,2	0,8	0,0	0,0
TRC3	0,2	0,8	0,2	0,2
Mean	3,8	3,8	3,8	3,8
SD	11,4	8,9	13,4	11,6

The main result is that over the year's exports and imports intensity of Western developed regions have been declining compared to other regions. In other words, trade has been diffusing from West to East. Overall, liberal policies and de-regulation process in Turkey has resulted in rapidly increasing trade openness which might have large and heterogeneous impact on regional economies which is an issue to be investigated in the next section. Before proceeding with the formal examination of the impact of trade

liberalization on regional inequalities, we chart the evolutions of trade openness and regional income inequalities in Turkey (In Figure 4.31). In terms of spatial inequalities, *CV, WCV* and *Theil* indices are displayed in accordance with former sections.
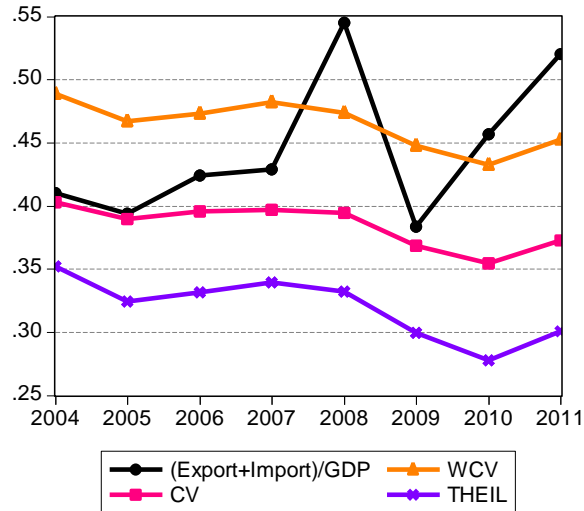
Figure 4.31. Regional Inequality vs. Trade Openness

Although, at a glance, a negative relationship is observed, which means that trade liberalization is coupled with a decline in regional disparities, the association is unlikely to be significant. However, as argued before, disaggregating the trade into its components, (i.e. exports and imports) might, in fact, give different outcomes. Therefore, it needs a deeper analysis. In fact, we proceed with the explanation of our empirical model and estimation procedures in the next sub-section.

4.4. Empirical Models of Trade Openness and Convergence

The model we propose is based on the following dynamic panel regression equation which consists of 182 observations (26regions x7years).

$$\ln\left(\frac{y_{i,t}}{y_{i,t-1}}\right) = \gamma + {}_1\ln y_{i,t-1} + {}_2\ln \exp_{i,t} + {}_3\ln \text{imp}_{i,t} + {}_4\ln \exp_{i,t} * \ln y_{i,t-1} +$$
$${}_5\ln \text{imp}_{i,t} * \ln y_{i,t-1} + {}_6\ln \text{public}_{i,t} + {}_7\ln \text{private}_{i,t} + {}_8\ln \text{humancap}_{i,t} + {}_{i,t}$$
$$i=1,...,26 \quad t=2005,...,2011 \tag{10}$$

The dependent variable is the annual growth rates of real GVA per capita in region i at year t. The first independent variable is the initial income per capita, $y_{i,t}$. δ_1 captures the convergence/divegence trend such that a negative and significant δ_1 would indicate an evidence of convergence pattern along which initially poorer regions grow faster than the richer ones. (Barro and Sala-i Martin, 1991)

$exp_{i,t}$ and $imp_{i,t}$ represent respectively the shares of exports and imports in total GVA of region *i* at year *t*. The impact of each variable is expected to be different. As indicated by, Rodriquez-Pose and Gill (2006), export firms will largely contribute to employment growth and wage patterns, which is likely to promote the local development. Similarly, enlargement of market size due to an export orientation enhances economies of scale, internal competition and productivity growth (Fu 2004; Krueger 1978, Daumal and Ozyurt 2011). Imports, on the other hand, are expected to have a controversial impact on growth. This may also depend on the type of goods imported. If they are mostly intermediate capital goods, especially inputs for high-tech commodities, it might well stimulate the domestic production by creating supply-chain and knowledge transfers (Grossman and Helpman 1991). Otherwise, imports are likely to have a detrimental impact on regional growth.

Two interaction terms between initial income and foreign trade have been added so to understand the impact of trade on regional inequalities. Such that if δ_4<0 and significant, it means that as poorer regions opens up their markets with an export-orientation, they will grow faster than the richer ones. Or, if $\delta_5>0$, for instance, poorer regions that experience an import-based liberalization, will tend to grow slower than the richer regions.

The other three variables are referred to as control variables which are commonly used in the literature. *humancap* represents the education quality which is proxied by number of students per teacher in the region. *private* captures the stock of physical private capital which is proxied by total electricity consumption (MWh) in manufacturing firms divided into total GVA of the region. *public* represents the share of government investments in regional GVA. Finally, $\mu_{i,t}$ is the error term which is assumed to follow, *iid(0,σ)*, an identical and independent normal distribution with zero mean and constant variance. All included variables are expressed in natural logarithms.

With regard to the estimation method, one of the most important shortcomings of simple OLS is the problem of neglected endogeneity. Indeed, in this case, this

problem might be even more acute since each region is likely to have a specific fixed effect. This is likely to create an unobserved heterogeneity across regions. To be able to cope with this, the regression equation (10) is preferred for estimation using a type of fixed effects model 'Least Squares Dummy Variable (LSDV)' approach which controls the region-specific effects by adding dummies for each region. (Except only one of them to avoid the dummy trap)

From a technical point of view, LSDV estimation might have a severe defect that spatial economic interactions among the regions are ignored. To address this, the cross-sectional spatial dependence is tested using Breusch-Pagan and CD Pesaran tests in the last two rows of the regression. In terms of spatial weight matrices, the nearest 2 neighbors methodology is used which picks, for each region, the closest two neighboring regions that takes on value 1, others 0 and construct an adjacency matrix in this way. This matrix is called as *W2*, and the ones with more than 2 neighbors respectively *W4, W6* and *W8*. For both tests, results indicate a strongly evident cross sectional spatial dependence which needs to be taken into account in the regression analysis.

Among the variety of spatial models introduced in the literature (Anselin, 1988) the most comprehensive ones seem to be the Spatial Durbin Models that include both spatial dependence in the dependent variable/error terms and spatial lags of independent variables. Therefore, the dynamic panel models are preferred to estimation by using Spatial Durbin Models which takes, specifically, two forms: i. as in equation 11 below (with spatial dependence in the dependent variable), ii. as in equation 12 (with spatial dependence in the error terms)

$$
\begin{aligned}
\ln\left(\frac{y_{i,t}}{y_{i,t-1}}\right) &= \gamma + \rho W \ln\left(\frac{y_{i,t}}{y_{i,t-1}}\right) + \delta_1 \ln y_{i,t-1} + \delta_2 \ln \exp_{i,t} + \delta_3 \ln \mathrm{imp}_{i,t} + \\
&\quad \delta_4 W \ln \exp_{i,t} + \delta_5 W \ln \mathrm{imp}_{i,t} + \delta_6 \ln \exp_{i,t} * \ln y_{i,t-1} + \\
&\quad \delta_7 \ln \mathrm{imp}_{i,t} * \ln y_{i,t-1} + \delta_8 \ln \mathrm{public}_{i,t} + \delta_9 \ln \mathrm{private}_{i,t} + \\
&\quad \delta_{10} \ln \mathrm{humancap}_{i,t} + \mu_{i,t}
\end{aligned}
\tag{11}
$$

and

$$
\begin{aligned}
\ln\left(\frac{y_{i,t}}{y_{i,t-1}}\right) &= \gamma + {}_1 \ln y_{i,t-1} + {}_2 \ln \exp_{i,t} + {}_3 \ln \mathrm{imp}_{i,t} + {}_4 W \ln \exp_{i,t} \\
&\quad + {}_5 W \ln \mathrm{imp}_{i,t} + {}_6 \ln \exp_{i,t} * \ln y_{i,t-1} + {}_7 \ln \mathrm{imp}_{i,t} * \ln y_{i,t-1} \\
&\quad + {}_8 \ln \mathrm{public}_{i,t} + {}_9 \ln \mathrm{private}_{i,t} + {}_{10} \ln \mathrm{humancap}_{i,t} + {}_{i,t}
\end{aligned}
$$

$$
{}_{i,t} = W \, {}_{j,t}
\tag{12}
$$

where ρ captures the externality created by neighboring regions on the growth rates of region i (Ertur and Koch, 2007). λ represents, instead, the spatial dependence in the error terms of regions i and j. Spatial lags of export and import intensity of the regions are also added to capture the impact of spillovers created by trade linkages among neighboring regions (captured by *Wlnexp* and *Wlnimp* variables). Both models are estimated using Maximum Likelihood methodology. In terms of spatial weights, four different matrices are used (W2, W4, W6, and W8 in App 2) to ensure the robustness of results with respect to different types.

4.5. Results

As a start, the absolute convergence is tested as it is a standard way of analyzing the inequalities in table 4.6. (Barro et al., 1992). The OLS regression in column 1 includes only initial income as an explanatory variable and column 2 includes both initial income and regional dummies. In both regressions, initial income has a negative and significant coefficient that indicates an evidence of absolute convergence. The rate of convergence is higher in second column as the coefficient is greater in size. However, in these regressions, trade and other control and spatial variables are not included which may significantly alter the results. In Table 4.7, they are included as well.

Table 4.6. Absolute Convergence Test

Independent Variables:	Model without regional dummies (1)	Model with regional dummies (2)
α	0.119***	0.119***
ln y_1	-0.022**	-0.022**
R-Squared	0.032	0.033
N	182	182
Diagnostics:		
BP-LM local cross-sectional *dependence test*	92,30***	92,30***
CD Pesaran local cross-sectional *dependence test*	8,63***	8,63***

Note: *** denotes significance at 1 %, ** at 5 %, * at 10

The results of dynamic panel estimations (without spatial effects) are summarized in the table 4.7. Model 1 in the first column of Table 4.7 shows the

regression results without control variables. In Models 2.4, each control variable is added one-by-one and finally, Model 5 represents the full model including all variables.

Three important results appear to emerge from estimations. Firstly, in all regressions (table 4.7), coefficient of initial income is negative and significant at 1 % which constitutes a strong evidence of declining inequalities across the regions, in other words, poor regions grow more than rich regions.

Table 4.7. Dynamic Panel Fixed Effect Estimations

Independent Variables:	Model 1	Model2	Model 3	Model 4	Model 5
α	2,086***	2,077***	2,000***	2,421***	2,342***
ln y_1	-0,515***	-0,496***	-0,507***	-0,426***	-0,404***
ln ex	0,408***	0,378***	0,403***	0,443***	0,412***
ln im	-0,319***	-0,313***	-0,340***	-0,447***	-0,455***
ln y_1*ex	-0,105***	-0,099***	-0,104***	-0,111***	-0,104***
ln y_1*im	0,100***	0,100***	0,105***	0,131***	0,133***
ln public	-	0,025**	-	-	0,023*
ln private	-	-	0,019	-	0,014
ln humancap	-	-	-	-0,209***	-0,206***
R-Squared	0,49	0,5	0,49	0,55	0,57
N	182	182	182	182	182
Diagnostics:					
BP-LM local cross-sectional dependence test	58,57***	54,89***	56,87***	43,63**	43,04***
CD Pesaran local cross-sectional dependence test	6,83***	6,16***	6,58***	5,49***	5,03***

Note: *** denotes significance at 1 %, ** at 5 %, * at 10, BP-LM test: Breusch-Pagan Lagrange Multiplier Test.

Second, regarding the impact of trade openness on regional growth, there is a controversial relation exists for export and import. It is evident at export-oriented liberalization significantly promotes the regional growth while import-based openness has, rather, a detrimental impact. Regions that have more export base economic activity grow more than others. For import, an opposite effect is observed, that means the further import base activities lead to declining growth rate in regions. More importantly, results indicate a clear set of evidence for the impact of trade on regional inequality which is captured by the coefficients of interaction terms between initial income and trade variables (δ_4 and δ_5).

This result is actually twofold: on the one hand, δ_4 is negative and significant at 1 % in all regressions which indicates the fact that initially poorer regions that open up their markets with an export orientation tend to catch up the richer regions and reduce the income gap. On the other hand, δ_5 is positive and significant at 1 % indicating that poorer regions which experience an import-based liberalization tend to diverge from richer ones. The size of the coefficient of exports is, however, greater than that of imports. Overall, the estimated net impact of trade seems to be negative. Hence one may argue that, in Turkey, the trend of economic convergence is associated with the trade openness, conditional upon export-led liberalization of regions.

Finally, among the tested control variables, public investment has a positive and significant coefficient at 10 % and human capital has a negative and significant coefficient at 1 % level. This indicates the fact that public resources directed to underdeveloped places, particularly to the Eastern regions, help promoting the economic growth while the level of education has surprisingly a detrimental effect. Finally, private capital stock has an insignificant effect.

Results of Spatial Durbin Model and Spatial Error Model are summarized in Table 4.8 and 4.9. The first four columns in Table 4.8 present the results from equation (11) and the other columns show the estimation results of equation (12). The results appear to be quite consistent with previous findings. However, there are also some additional features. i. Positive spatial spillovers among the growth rates and error terms of neighboring regions are strongly evident as ρ and are positive and significant at 1% regardless of type of spatial model and weights used. ii. Declining inequalities across regions are again found to be present since δ_1 is negative and significant at 1 % in all regressions. iii. as δ_6 is negative and significant at 1%, it has been found once more that initially poorer regions that experience an export-based liberalization tend to grow faster than the richer ones.

The impact of import-led liberalization is, however, controversial. Such that it has a detrimental effect on the growth rate of underdeveloped areas. iv. With regard to the importance of control variables, their impact seems to be non-robust and varying across the regression specifications.

Table 4.8. Spatial Durbin Model: Fixed Effect Estimations

Independent Variables:	LAG				ERROR			
	W2	W4	W6	W8	W2	W4	W6	W8
ρ or	0,322***	0,438***	0,466***	0,466***	0,415***	0,568***	0,646***	0,646***
ln y_1	-0,424***	-0,453***	-0,452***	-0,452***	-0,478***	-0,490***	-0,490***	-0,490***
ln ex	0,297***	0,270***	0,290***	0,290***	0,348***	0,304***	0,246***	0,246***
ln im	-0,256***	-0,197**	-0,203***	-0,203***	-0,335***	-0,262***	-0,207***	-0,207***
*ln y_1*ex*	-0,077***	-0,071***	-0,075***	-0,075***	-0,090***	-0,080***	-0,066***	-0,066***
*ln y_1*im*	0,075***	0,057***	0,056***	0,056***	0,098***	0,077***	0,061***	0,061***
W ln ex	0,013	0,038*	0,033	0,033	0,005	-0,001	-0,026	-0,026
W ln im	0,024**	0,032**	0,043**	0,043**	0,028**	0,049**	0,099***	0,099***
ln public	0,017*	0,018**	0,017**	0,017**	0,01	0,012	0,012	0,012
ln electricity	0,006	-0,006	-0,009	-0,009	0,006	0,003	0,002	0,002
ln humancapital	-0,128***	-0,114***	-0,116***	-0,116***	-0,127***	-0,075	-0,067	-0,067
N	182	182	182	182	182	182	182	182

Note: *** denotes significance at 1 %, ** at 5 %, * at 10,

Table 4.9. Spatial Error Model with sectorial trade: Fixed Effect Estimations

Independent Variables:	W2	W4	W6	W8	W2	W4	W6	W8
	0,583***	0,731***	0,787***	0,808***	0,554***	0,703***	0,767***	0,783***
ln y_1	-0,482***	-0,483***	-0,483***	-0,497***	-0,236***	-0,265***	-0,282***	-0,282***
ln agrex	-0,064**	-0,068***	-0,045**	-0,041*	-	-	-	-
ln manuex	0,211**	0,207**	0,157*	0,176**	-	-	-	-
ln y_1*agrex	0,017**	0,018***	0,012*	0,011*	-	-	-	-
ln y_1*manuex	-0,051**	-0,052**	-0,040*	-0,046**	-	-	-	-
ln agrim	-	-	-	-	-0,152***	-0,140***	-0,120***	-0,126***
ln manuim	-	-	-	-	0,055	0,061	0,044	0,069
ln y_1*agrim	-	-	-	-	0,039***	0,037***	0,032***	0,033***
ln y_1*manuim	-	-	-	-	-0,007	-0,010	-0,008	-0,015
ln public	-0,003	0,002	0,003	0,006	-0,002	0,001	0,002	0,006
ln electricity	0,009	0,003	-0,004	-0,009	0,000	-0,001	-0,004	-0,007
ln humancapital	-0,077	-0,058	-0,051	-0,058	-0,051	-0,027	-0,033	-0,043
N	182	182	182	182	182	182	182	182

Note: *** denotes significance at 1 %, ** at 5 %, * at 10,

The economic interpretation of these results is also important. In accordance with Krugman and Elizondo (1996)'s argument, export-based liberalization enhances the development of backward regions and contributes to convergence process. The mechanism is likely to work in a following way: as the country opens up its markets to trade, exporting firms tend to prefer the central market places less since the land costs, congestion, labor costs and internal competition is higher.

In contrast, they prefer to relocate and move towards peripheral regions in search of higher profit margin (Fan and Casetti 1994, Rodriquez-Pose and Gill 2006). This diffusion process fosters the economic growth in lagging regions, and so, it reduces the income gap. To support this argument, Table 4.5 documents the regional shares of export and import volumes in total exports and imports of the country in years 2004 and 2011.

The table looks totally supportive of the argument of this study. Such that, while in 2004 exporting volumes are mostly concentrated around Istanbul and other Western regions, which are relatively developed places, in 2011 their share decreases considerably. For instance, Istanbul's share in total export decreases from 58 % in 2004 to 45 % in 2011 while the shares of Eastern regions increase. Moreover, cross sectional standard deviation of regional export shares decline from 11.4 to 8.9. Although same trend is also present for import shares, the pattern is more obvious for exports. Consequently, diffusion of export activities from Western regions to Eastern ones contributes to the development of backward regions.

In addition to the perspectives adopted in the study so far, disaggregating the trade data further might provide valuable insights about its impact on regional economies. Indeed, trade done in different industries might have far different impact on regional inequalities. To address this issue, the econometric model is re-estimated using the trade data at the sectorial level. Two basic sectors are considered; manufacturing and agriculture.

The results are summarized in Table 4.9. First, once more, spatial spillover among the growth rate of regions is consistently evident at 1 % in all regressions. Second, initially poorer regions that experience a liberalization based on the export of manufacturing goods tend to benefit the process and grow faster than the richer ones. In contrast, export of agriculture goods has an opposite effect.

In the light of these findings, it is plausible to argue that diffusion of export-firms from Western to Eastern regions accelerates the process of regional convergence.

Indeed, this process is likely to be faster in manufacturing sector since the production factors are more mobile that can easily diffuse throughout the country.

CHAPTER 5

CONCLUSIONS

Many countries in the world and supranational bodies (like EU) devote a significant share of their budgets to promote territorial and economic cohesion. The effects of opening up the markets to international trade on the evolution of the regional disparities are widely discussed in the literature. Regarding Turkey, such issue has not yet been adequately studied.

In this thesis, we investigated the impact of trade liberalization on the evolution of regional income inequalities. To do so, we implemented various econometric and spatial analyses. They, indeed, yield several remarkable conclusions.

First, the spatial distribution of the regional income (GDP and GVA per capita) and other variables such as public investments, private investments, infrastructure, human capital and population were investigated for NUTS I, II and III level regions and over a period 1975-2011 as long as the data is available. The analyses reveal that the income is not randomly distributed across the regions of Turkey, but it is spatially concentrated and clustered, especially around the Western regions. Poorer regions concentrated on the Eastern part which indicates the existence of west-east dualism. This finding is also consistent with the results in literature Gezici and Hewings (2004). More importantly, we find that the regional income inequalities tend to decline from 1975 to 2011. The study reveals that the income diffused from west to the east over time. For instance, the relative income ranges between 0.35 and 2.01 in 1980, and it is between 0.47 and 1.7 in 2010 at NUTS II level. Western regions like TR10, TR42 and TR31 are the most developed regions. In addition to the east-west spatial division, analyses also indicate the existence of the coastal-interior spatial pattern.

Overall, it is not wrong to suggest that although income is diffusing from western regions to the eastern ones, and the regional income gap decreasing, the inequality level is still high compared to the developed countries such as US, Canada etc. (Rodriguez Pose, 2012).

Secondly, the evolution of spatial inequalities is examined over time by using several indices such as Theil, coefficient of variation, and population weighed

coefficient of variation (*WCV*). This analysis is also done for additional spatial divisions such as the divisions of west -east, and interior-coast of the Turkey (for further information, please, see appendix A). These analyses have been implemented using both per capita and per labor regional incomes.

All the indices based on per capita GDP and GVA yield similar consistent outputs. The overall spatial inequalities are found to decline from 1975 to 2011. However, the level of such inequalities is still quite high. Likewise all indices, *WCV*, for instance, have declined from 0.59 (in 1975) to 0.45 (in 2011). However, the results differ once we use per labor incomes. It reveals that the tendency of regional disparities are constant and at a lower level compared to the per capita analyses (as 2011 *WCV* value in per capita analysis is about 0.5 and in per labor analysis it is about 0.3). But still it is far above the inequality level of developed countries (in Australia, for instance, it is 0.08 in 2005 or across US States it is 0.13 in 2004) (Rodriguez-Pose, 2012). The contradicting results between per capita and per labor analyses can be a result of migration patterns concurring frequently from East-West and/or direct or indirect transfers to the underdeveloped areas.

As a third analyses, regional increase in trade openness have been investigated over time. It reveals that the TR10 (Istanbul) is a giant in terms of its both export and import volume. But we observe that the TR10 has lost its share in both exports and imports after 2004. Its share has declined from 58.3 % to 45.5 % in export, and declined from 69.1 % to 60 % in import between 2004- 2011. In addition, the share of TR31 (İzmir) has also declined around %5 both in exports and imports. More interestingly, the South Eastern regions like TRB2, TRC2 and TRC3 mostly benefit from these trade diffusions, and they increased their trade share almost 4 times between 2004- 2011. It is not wrong to suggest that the reopening of the border gates on the border of Syria, Iraq and Iran, may have motivated such regions to trade more due to the closeness to the market.

Fourth, most importantly, we analyzed the impact of trade liberalization on the evolution of regional income disparities using Dynamic Spatial Panel Regressions. The overall increase in national trade openness seems to have ambiguous effects on regional disparities. However, decomposition of the trade provides valuable insights. So, we can summarize our results from regression analysis in several items. i. Regardless of methodology used, absolute beta convergence is present in all regressions. Hence poorer regions tend to grow faster than the richer ones. ii. Initially poorer regions that

experience export-based trade liberalization (particularly in manufacturing goods, not in agricultural goods) tend to grow faster than richer ones. Imports, on the other hand, have an opposite effect which has a detrimental effect on regional growth. Hence, trade openness is found to induce the regional convergence only if poor regions adopt an export-based liberalization, particularly in industrial goods. iii. spatial spillovers of growth is found evident across regions regardless of the type of methodology employed (whether or not it is spatial autoregressive or spatial error model). Such that growth in one region is positively spilled over to the neighboring regions

In the light of these results, the determination of strategies and policies that aim at balancing the regional disparities should be based on the region specific characteristics. The uncontrolled trade liberalization policies lead to shrinkage in the import substitution industries due to the competitive nature of international market, while, the controlled liberalization process leads to transformation of South Korea into an Asian tiger (Pamuk, 2014). So, the policies should be adopted in order to maintain a quick but controlled export base development of backward regions. So, policies should be adopted to motivate the regions to increase their export volume, especially manufacturing oriented export. Additionally and more specifically, primarily the underdeveloped regions should be promoted by export based growth strategies in order to control more balanced development. Investments such as industrial zones based on diverse sectorial production and free zones should be devoted to such poorer regions.

Lastly, contrary to the fast trade openness of Turkish economy, there are still some historical barriers existing in the trade policies, such as no trade with Armenia, and the closed border gates for a time interval with the southern eastern neighbors. Such trade barriers should be removed in a controlled manner in order to ensure the integration to the international market.

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APPENDIX A

ALTERNATIVE DIVISIONS OF REGIONS

Table A.1. NUTS I Level Regions

Region	Number	East/West	Interior/Coast
TR1	1	E	C
TR2	2	E	C
TR3	3	E	C
TR4	4	E	C
TR5	5	E	I
TR6	6	E	C
TR7	7	W	I
TR8	8	W	C
TR9	9	W	C
TRA	10	W	I
TRB	11	W	I
TRC	12	W	I

Table A.2. NUTS II Level Regions

Region	Number	NUTSI	East/West	Interior/Coast
TR10	1	R1	E	C
TR21	2	R2	E	C
TR22	3	R2	E	C
TR31	4	R3	E	C
TR32	5	R3	E	C
TR33	6	R3	E	I
TR41	7	R4	E	C
TR42	8	R4	E	C
TR51	9	R5	E	I
TR52	10	R5	E	I
TR61	11	R6	E	C
TR62	12	R6	E	C
TR63	13	R6	E	C
TR71	14	R7	E	I
TR72	15	R7	E	I
TR81	16	R8	E	C
TR82	17	R8	W	C
TR83	18	R8	W	C
TR90	19	R9	W	C
TRA1	20	R10	W	I
TRA2	21	R10	W	I
TRB1	22	R11	W	I
TRB2	23	R11	W	I
TRC1	24	R12	E	I
TRC2	25	R12	W	I
TRC3	26	R12	W	I

Table A.3. NUTS III Level Regions

Region	Number	NUTS 1	NUTS2	East/West	Interior/Coast
Adana	1	R6	R12	W	C
Adiyaman	2	R12	R24	E	I
Afyon	3	R3	R6	E	I
Agri	4	R10	R21	E	I
Amasya	5	R8	R18	E	I
Ankara	6	R5	R9	W	I
Antalya	7	R6	R11	W	C
Artvin	8	R9	R19	E	C
Aydin	9	R3	R5	W	C
Balikesir	10	R2	R3	W	C
Bilecik	11	R4	R7	W	I
Bingol	12	R11	R22	E	I
Bitlis	13	R11	R23	E	I
Bolu	14	R4	R8	W	C
Burdur	15	R6	R11	W	I
Bursa	16	R4	R7	W	C
Canakkale	17	R2	R3	W	C
Cankiri	18	R8	R17	E	I
Corum	19	R8	R18	E	I
Denizli	20	R3	R5	W	I
Diyarbakir	21	R12	R25	E	I
Edirne	22	R2	R2	W	C
Elazig	23	R11	R22	E	I
Erzincan	24	R10	R20	E	I
Erzurum	25	R10	R20	E	I
Eskisehir	26	R4	R7	W	I
Gaziantep	27	R12	R24	W	I
Giresun	28	R9	R19	E	C
Gumushane	29	R9	R19	E	I
Hakkâri	30	R11	R23	E	I
Hatay	31	R6	R13	W	C
Icel	32	R6	R12	W	C
Isparta	33	R6	R11	W	I
Istanbul	34	R1	R1	W	C
Izmir	35	R3	R4	W	C
K.Maras	36	R6	R13	E	I
Kars	37	R10	R21	E	I
Kastamonu	38	R8	R17	E	I
Kayseri	39	R7	R15	W	I
Kirklareli	40	R2	R2	W	C
Kirsehir	41	R7	R14	E	I
Kocaeli	42	R4	R8	W	C
Konya	43	R5	R10	W	I
Kutahya	44	R3	R6	E	I
Malatya	45	R11	R22	E	I
Manisa	46	R3	R6	W	I
Mardin	47	R12	R26	E	I
Mugla	48	R3	R5	W	C
Mus	49	R11	R23	E	I
Nevsehir	50	R7	R14	E	I
Nigde	51	R7	R14	E	I
Ordu	52	R9	R19	E	C

Rize	53	R9	R19	E	C
Sakarya	54	R4	R8	W	C
Samsun	55	R8	R18	E	C
Sanliurfa	56	R12	R25	E	I
Siirt	57	R12	R26	E	I
Sinop	58	R8	R17	E	C
Sivas	59	R7	R15	E	I
Tekirdag	60	R2	R12	W	I
Tokat	61	R8	R18	E	I
Trabzon	62	R9	R19	E	C
Tunceli	63	R11	R22	E	I
Usak	64	R3	R6	W	I
Van	65	R11	R23	E	I
Yozgat	66	R7	R15	E	I
Zonguldak	67	R8	R16	W	C

APPENDIX B

SPATIAL WEIGHT MATRIXES

Table B.1. 2 Neighbors Spatial Weight Matrix

	TR10	TR21	TR22	TR31	TR32	TR33	TR41	TR42	TR51	TR52	TR61	TR62	TR63	TR71	TR72	TR81	TR82	TR83	TR90	TRA1	TRA2	TRB1	TRB2	TRC1	TRC2	TRC3
TR10	0	0.5	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR21	0.5	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR22	0	0.5	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR31	0	0	0.5	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR32	0	0	0	0	0	0.5	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR33	0	0	0	0	0.5	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR41	0	0	0	0	0	0.5	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR42	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0
TR51	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0
TR52	0	0	0	0	0	0	0	0	0.5	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0
TR61	0	0	0	0	0.5	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR62	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0.5	0	0	0	0	0	0	0	0	0	0	0	0
TR63	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0
TR71	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0
TR72	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0
TR81	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0
TR82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0.5	0	0	0	0	0	0	0	0
TR83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0.5	0	0	0	0	0	0	0	0	0
TR90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0.5	0	0	0	0	0
TRA1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0.5	0	0	0	0
TRA2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0.5	0	0	0
TRB1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0.5	0
TRB2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0.5
TRC1	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0.5	0
TRC2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0.5
TRC3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0.5	0

Table B.2. 4 Neighbors Spatial Weight Matrix

	TR10	TR21	TR22	TR31	TR32	TR33	TR41	TR42	TR51	TR52	TR61	TR62	TR63	TR71	TR72	TR81	TR82	TR83	TR90	TRA1	TRA2	TRB1	TRB2	TRC1	TRC2	TRC3
TR10	0	0.25	0.25	0	0	0	0.25	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR21	0.25	0	0.25	0.25	0	0	0	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR22	0.25	0.25	0	0.25	0	0	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR31	0	0.25	0.25	0	0.25	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR32	0	0	0.25	0.25	0	0.25	0	0	0	0	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR33	0	0	0.25	0.25	0.25	0	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR41	0	0	0.25	0	0	0.25	0	0.25	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR42	0.25	0	0	0	0	0	0.25	0	0.25	0	0	0	0	0.25	0	0	0	0	0	0	0	0	0	0	0	0
TR51	0	0	0	0	0	0	0.25	0.25	0	0.25	0	0	0	0	0	0.25	0	0	0	0	0	0	0	0	0	0
TR52	0	0	0	0	0	0	0	0	0.25	0	0.25	0.25	0	0.25	0	0	0	0	0	0	0	0	0	0	0	0
TR61	0	0	0	0	0.25	0.25	0	0	0	0.25	0	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR62	0	0	0	0	0	0	0	0	0	0.25	0.25	0	0.25	0	0	0	0	0	0	0	0	0	0	0.25	0	0
TR63	0	0	0	0	0	0	0	0	0	0	0	0.25	0	0.25	0	0	0.25	0.25	0	0	0	0	0	0	0	0
TR71	0	0	0	0	0	0	0	0.25	0	0.25	0.25	0	0	0	0.25	0	0	0	0	0	0	0	0	0	0	0
TR72	0	0	0	0	0	0	0	0	0	0	0	0.25	0.25	0	0	0	0.25	0	0	0	0	0.25	0	0	0	0
TR81	0.25	0	0	0	0	0	0	0	0.25	0	0	0	0	0	0.25	0	0.25	0	0	0	0	0	0	0	0	0
TR82	0	0	0	0	0	0	0	0	0	0	0	0.25	0.25	0	0	0.25	0	0.25	0	0	0	0	0	0	0	0
TR83	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0.25	0.25	0	0.25	0	0	0	0	0	0	0	0	0
TR90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0	0.25	0.25	0.25	0	0	0	0
TRA1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0	0.25	0.25	0	0.25	0	0
TRA2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0.25	0	0	0.25	0	0	0.25
TRB1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0	0	0	0.25	0.25	0	0	0	0.25	0	0
TRB2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0.25	0	0	0.25	0.25
TRC1	0	0	0	0	0	0	0	0	0	0	0	0.25	0	0	0	0	0	0	0	0.25	0	0.25	0	0	0.25	0
TRC2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0	0	0.25	0.25	0	0.25
TRC3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0	0.25	0.25	0	0.25

Table B.3. 6 Neighbors Spatial Weight Matrix

	TR10	TR21	TR22	TR31	TR32	TR33	TR41	TR42	TR51	TR52	TR61	TR62	TR63	TR71	TR72	TR81	TR82	TR83	TR90	TRA1	TRA2	TRB1	TRB2	TRC1	TRC2	TRC3
TR10	0	0.17	0.17	0	0	0.17	0.17	0.17	0	0	0	0	0	0	0	0.17	0	0	0	0	0	0	0	0	0	0
TR21	0.17	0	0.17	0.17	0	0	0.17	0.17	0	0	0	0	0	0	0	0.17	0	0	0	0	0	0	0	0	0	0
TR22	0.17	0.17	0	0.17	0.17	0.17	0.17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR31	0.17	0.17	0.17	0	0.17	0.17	0.17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR32	0	0	0.17	0.17	0	0.17	0.17	0	0	0.17	0.17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR33	0.17	0	0.17	0.17	0.17	0	0.17	0	0	0	0.17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR41	0.17	0	0.17	0	0	0.17	0	0.17	0.17	0	0	0	0	0	0	0.17	0	0	0	0	0	0	0	0	0	0
TR42	0.17	0	0	0	0	0.17	0.17	0	0.17	0	0	0	0	0	0	0.17	0	0.17	0	0	0	0	0	0	0	0
TR51	0	0	0	0	0	0	0.17	0.17	0	0.17	0	0	0	0.17	0	0.17	0.17	0	0	0	0	0	0	0	0	0
TR52	0	0	0	0	0	0.17	0	0	0.17	0	0.17	0.17	0.17	0.17	0	0	0	0	0	0	0	0	0	0	0	0
TR61	0	0	0	0	0.17	0.17	0.17	0.17	0	0.17	0	0.17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR62	0	0	0	0	0	0	0	0	0	0.17	0.17	0	0.17	0.17	0.17	0	0	0	0	0	0	0	0	0.17	0	0
TR63	0	0	0	0	0	0	0	0	0	0.17	0	0.17	0	0.17	0.17	0	0	0	0	0	0	0	0	0.17	0.17	0
TR71	0	0	0	0	0	0	0	0	0.17	0.17	0	0.17	0	0	0.17	0	0.17	0.17	0	0	0	0	0	0	0	0
TR72	0	0	0	0	0	0	0	0	0.17	0	0	0.17	0.17	0.17	0	0	0.17	0	0	0	0	0.17	0	0	0	0
TR81	0.17	0	0	0	0	0	0.17	0.17	0.17	0	0	0	0	0	0	0	0.17	0.17	0	0	0	0	0	0	0	0
TR82	0	0	0	0	0	0	0	0	0.17	0.17	0	0	0	0.17	0.17	0.17	0	0.17	0	0	0	0	0	0	0	0
TR83	0	0	0	0	0	0	0	0	0.17	0	0	0	0	0.17	0.17	0.17	0.17	0	0.17	0	0	0	0	0	0	0
TR90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.17	0	0	0.17	0	0.17	0.17	0.17	0	0	0.17	0
TRA1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.17	0	0.17	0.17	0.17	0	0.17	0.17
TRA2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.17	0.17	0	0.17	0.17	0	0.17	0.17
TRB1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.17	0	0	0	0.17	0.17	0.17	0	0	0	0.17	0.17
TRB2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.17	0.17	0.17	0	0.17	0.17	0.17
TRC1	0	0	0	0	0	0	0	0	0	0	0.17	0.17	0	0.17	0	0	0	0	0	0	0	0	0.17	0	0.17	0.17
TRC2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.17	0.17	0.17	0	0.17	0.17	0	0.17
TRC3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.17	0.17	0.17	0.17	0.17	0.17	0

Table B.4. 8 Neighbors Spatial Weight Matrix

	TR10	TR21	TR22	TR31	TR32	TR33	TR41	TR42	TR51	TR52	TR61	TR62	TR63	TR71	TR72	TR81	TR82	TR83	TR90	TRA1	TRA2	TRB1	TRB2	TRC1	TRC2	TRC3
TR10	0	0.13	0.13	0.13	0	0.13	0.13	0.13	0.13	0	0	0	0	0	0	0.13	0	0	0	0	0	0	0	0	0	0
TR21	0.13	0	0.13	0.13	0.13	0.13	0.13	0.13	0	0	0	0	0	0	0	0.13	0	0	0	0	0	0	0	0	0	0
TR22	0.13	0.13	0	0.13	0.13	0.13	0.13	0.13	0	0	0.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR31	0.13	0.13	0.13	0	0.13	0.13	0.13	0.13	0	0	0.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR32	0.13	0	0.13	0.13	0	0.13	0.13	0.13	0	0.13	0.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR33	0.13	0	0.13	0.13	0.13	0	0.13	0.13	0.13	0	0.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TR41	0.13	0	0.13	0.13	0.13	0.13	0	0.13	0.13	0	0	0	0	0	0	0.13	0	0	0	0	0	0	0	0	0	0
TR42	0.13	0.13	0.13	0	0	0.13	0.13	0	0.13	0	0	0	0	0	0	0.13	0.13	0	0	0	0	0	0	0	0	0
TR51	0	0	0	0	0	0.13	0.13	0.13	0	0.13	0	0	0	0.13	0	0.13	0.13	0.13	0	0	0	0	0	0	0	0
TR52	0	0	0	0	0	0.13	0.13	0.13	0.13	0	0.13	0.13	0.13	0.13	0	0	0	0	0	0	0	0	0	0	0	0
TR61	0	0	0	0.13	0.13	0.13	0.13	0	0.13	0.13	0	0.13	0	0.13	0	0	0	0	0	0	0	0	0	0	0	0
TR62	0	0	0	0	0	0	0	0	0.13	0.13	0.13	0	0.13	0.13	0.13	0	0	0.13	0	0	0	0	0	0.13	0	0
TR63	0	0	0	0	0	0	0	0	0	0.13	0	0.13	0	0.13	0.13	0	0	0.13	0	0	0.13	0	0.13	0.13	0	0
TR71	0	0	0	0	0	0	0	0	0.13	0.13	0.13	0.13	0.13	0	0.13	0	0.13	0.13	0	0	0	0	0	0	0	0
TR72	0	0	0	0	0	0	0	0	0	0	0	0.13	0.13	0.13	0	0	0.13	0.13	0.13	0	0.13	0	0.13	0	0	0
TR81	0.13	0.13	0	0	0	0	0.13	0.13	0.13	0	0	0	0	0.13	0	0	0.13	0.13	0	0	0	0	0	0	0	0
TR82	0	0	0	0	0	0	0.13	0.13	0.13	0.13	0	0	0	0.13	0.13	0.13	0	0.13	0	0	0	0	0	0	0	0
TR83	0	0	0	0	0	0	0	0	0.13	0	0	0.13	0.13	0.13	0.13	0.13	0.13	0	0.13	0	0	0	0	0	0	0
TR90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.13	0	0	0.13	0	0.13	0.13	0.13	0.13	0	0.13	0.13
TRA1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.13	0	0	0	0.13	0	0.13	0.13	0.13	0.13	0.13	0.13
TRA2	0	0	0	0	0	0	0	0	0	0	0	0	0.13	0	0.13	0	0	0	0.13	0.13	0	0.13	0.13	0	0.13	0.13
TRB1	0	0	0	0	0	0	0	0	0	0	0	0.13	0	0	0	0	0	0	0.13	0.13	0.13	0	0.13	0.13	0.13	0.13
TRB2	0	0	0	0	0	0	0	0	0	0	0	0	0.13	0	0.13	0	0	0	0.13	0.13	0.13	0.13	0	0	0.13	0.13
TRC1	0	0	0	0	0	0	0	0	0	0	0	0.13	0.13	0	0	0	0	0	0	0.13	0.13	0.13	0.13	0	0.13	0.13
TRC2	0	0	0	0	0	0	0	0	0	0	0	0	0.13	0	0	0	0	0	0.13	0.13	0.13	0.13	0.13	0.13	0	0.13
TRC3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.13	0	0	0	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0

APPENDIX C

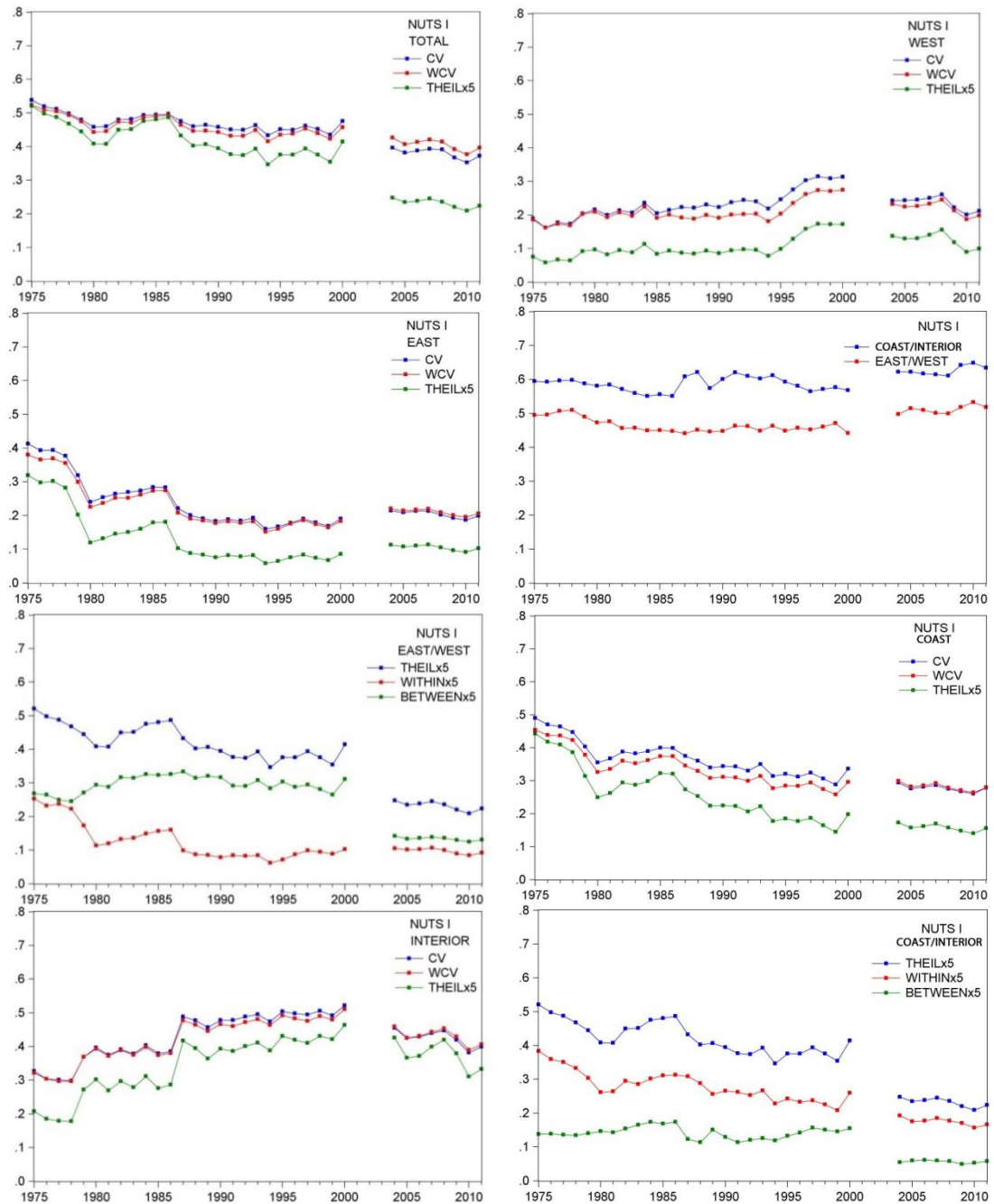# INCOME DISTRIBUTION NUTS I AND NUTS III LEVEL

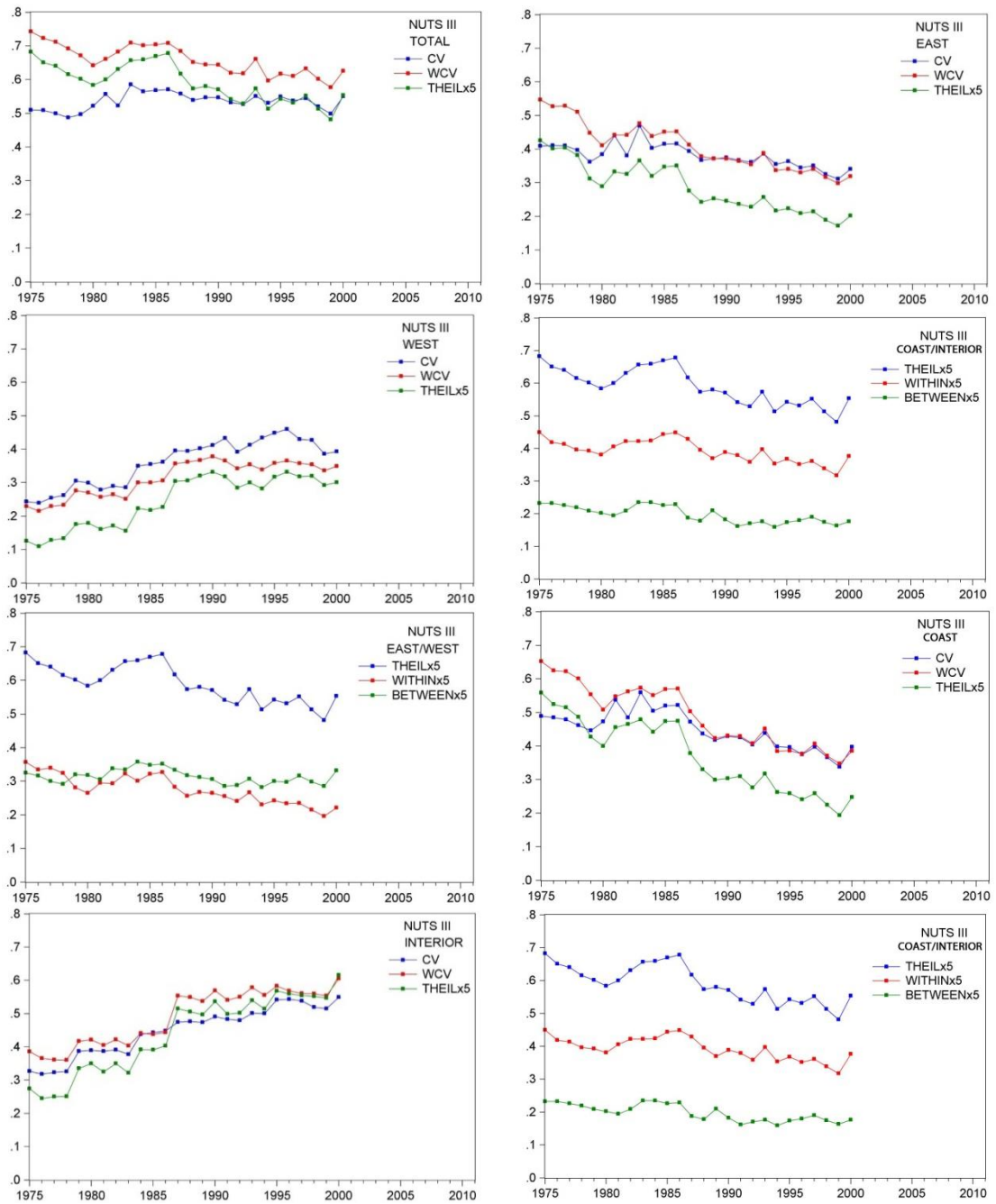Figure C.1. Evolution of regional disparities across NUTS I regions of Turkey

Figure C.2. Evolution of regional disparities across NUTS III regions of Turkey

APPENDIX D

SPATIAL PANEL REGRESSION RESULTS WITH PER LABOR INCOME

Table D.1. Absolute Convergence Test with per labor income

Independent Variables:	Model without regional dummies (1)	Model with regional dummies (2)
α	-0.690***	-0.638***
ln y_1	0.126	0.026***
R-Squared	0.001	0.95
N	182	182
Diagnostics:		
BP-LM local cross-sectional *dependence test*	61,95***	68,50***
CD Pesaran local cross-sectional *dependence test*	3,26***	3,59***

Note: *** denotes significance at 1 %, ** at 5 %, * at 10,

Table D.2. Dynamic Panel Fixed Effect Estimations with Per Labor Income

Independent Variables:	Model 1	Model2	Model 3	Model 4	Model 5
α	-0,613***	-0,635***	-0,601***	-0,632***	-0,640***
ln y_1	0,371	-0,400	0,370	0,375	0,402
ln ex	-0,019*	0,378*	-0,019*	-0,019*	-0,018*
ln im	0,024**	-0,313**	0,024**	0,024**	0,023**
ln y_1*ex	-0,067	-0,099	-0,072	-0,068	-0,074
ln y_1*im	0,096	0,100	0,101	0,097	0,112
ln public	-	-0,008**	-	-	-0,008
ln private	-	-	-0,004	-	-0,003
ln humancap	-	-	-	0, 005***	0,004
R-Squared	0,79	0,78	0,95	0,78	0,95
N	182	182	182	182	182
Diagnostics:					
BP-LM local cross-sectional dependence test	63,68***	63,02***	62,47***	62,60***	62,71***
CD Pesaran local cross-sectional dependence test	3,30***	2,96***	3,12***	3.35***	2,8***

Note: *** denotes significance at 1 %, ** at 5 %, * at 10,

Table D.3. Spatial Durbin Model: Fixed Effect Estimations with Per Labor Income

	LAG				ERROR			
Independent Variables:	W2	W4	W6	W8	W2	W4	W6	W8
ρ or	0,126*	0,333***	0,385***	0,385***	0,249***	0,445***	0,477***	0,477***
ln y_1	0,370*	0,400*	0,417**	0,417**	0,423**	0,394*	0,430**	0,430**
ln ex	-0,006	-0,013	-0,019*	-0,190*	-0,012	-0,017*	-0,021**	-0,021**
ln im	0,021**	0,024**	0,028**	0,028***	0,025	0,028***	0,030***	0,030***
*ln y_1*ex*	-0,071	-0,052	-0,050	-0,050	-0,026	0,006	0,015	0,015
*ln y_1*im*	0,102	0,084	0,081	0,081	0,060	0,009	0,009	0,009
W ln ex	-0,040***	-0,013	0,015	0,015	-0,047***	-0,029	-0,005	-0,005
W ln im	0,019**	-0,006	-0,026	-0,026	0.029***	0,016	-0,007	-0,007
ln public	-0,013	0,018**	-0,002	-0,002	-0,009	-0,003	-0,001	-0,001
ln electricity	0,014	0,011	-0,003	-0,003	0,021	0,018	0,009	0,009
ln humancapital	0,037	0,042	0,023	0,023	0,059	0,079*	0,056	0,056
N	182	182	182	182	182	182	182	182

Note: *** denotes significance at 1 %, ** at 5 %, * at 10,

Table D.4. Spatial Error Model with sectorial trade: Fixed Effect Estimations with Per Labor Income

Independent Variables:	W2	W4	W6	W8	W2	W4	W6	W8
	0,337***	0,487***	0,494***	0,442***	0,203**	0,444***	0,464***	0,456***
ln y_1	0,274	0,230	0,263	0,364	0,893***	-0,826***	0,904***	0,909***
ln agrex	-0,008***	-0,005*	-0,005	-0,002	-	-	-	-
ln manuex	0,009	0,001	-0,002	-0,004	-	-	-	-
*ln y_1*agrex*	0,001	0,001	0,008	0,017	-	-	-	-
*ln y_1*manuex*	-0,028	-0,035	-0,039	-0,019	-	-	-	-
ln agrim	-	-	-	-	-0,002	-0,140***	0,001***	0,001
ln manuim	-	-	-	-	0,010	0,061	0,010	0,013
ln y_1*agrim	-	-	-	-	0,033	0,037***	0,055***	0,041
ln y_1*manuim	-	-	-	-	0,100	-0,010	0,062	0,087
ln public	-0,007	-0,004	-0,003	-0,003	-0,009	0,001	-0,005	-0,005
ln electricity	0,034**	0,026	0,026	0,023	0,011	-0,001	0,014	-0,013
ln humancapital	0,017	0,027	0,027	0,019	0,028	-0,027	0,056	0,051
N	182	182	182	182	182	182	182	182

Note: *** denotes significance at 1 %, ** at 5 %, * at 10,