REGIONAL CONVERGENCE, MIGRATION AND FACTOR MOBILITY IN TURKEY

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ABSTRACT

REGIONAL CONVERGENCE, MIGRATION AND FACTOR MOBILITY IN TURKEY

The vast majority of the regional studies have focused on the evolution of income inequalities across regions. The empirical literature has largely been inspired by Neoclassical Growth Theory which predicts convergence of economies to a unique steady state.

In terms of factor mobility, far little attention has been paid to the impact of human mobility. Indeed, few studies have tried to investigate the migration patterns related to regional inequalities. Within these studies, there has been quite a little attempt to examine the impacts of migration sub-components.

The purpose of the thesis is to investigate the following research questions: Do regional income inequalities tend to increase/decrease in Turkey? Does recent migration reduce income inequalities across regions? How do the components of migration (with respect to age, gender, education) affect regional income distribution?

The empirical study covers a period between 2004 and 2014 for 26 NUTS II regions of Turkey. A wide range of statistical tools was applied: Descriptive Statistics, Explorative Analysis, Global and Local Moran *I*'s tests, Pearson Correlation Coefficient, LSDV Panel Regression, Robust Lagrange Multiplier Tests, Spatial Error and Lag Models.

Consequently, regional income inequalities are found to be quite sizable in Turkey. However, income disparities tend to decline and regions tend to converge. Increasing migration is found to reduce regional income disparities. Nearly all migration components tend to affect the income growth negatively with different impact factors. Briefly, the novel contribution of the study is to reveal a converging trend in per capita income growth of regions and different impacts of migration components, recently.

Keywords: Ecoomic Growth Theories, Regional Inequalities, Convergence, Internal Migration

ÖZET

TÜRKİYE'DE BÖLGESEL YAKINSAMA, GÖÇ VE FAKTÖR HAREKETLİLİĞİ

Bölgesel çalışmaların büyük çoğunluğu bölgeler arası gelir eşitsizliklerinin evrimi üzerine odaklanmaktadır. Ampirik yazın büyük ölçüde, ekonomilerin belli bir durağan duruma yakınsayacağını tahmin eden Neoklasik Büyüme Kuramından etkilenmektedir.

Faktör hareketliliği açısından, insan hareketliliğinin etkisine çok az dikkat edilmiştir. Gerçekten de, az sayıda çalışma bölgesel eşitsizliklerle ilgili göç örüntülerini araştırmaya çalışmıştır. Bu çalışmalarda da, göçün alt bileşenlerinin etkilerini incelemek için çok az girişimde bulunulmuştur.

Bu tezin amacı, şu araştırma sorularını incelemektir: Türkiye'de bölgesel gelir eşitsizlikleri artmakta mı, yoksa azalmakta mıdır? Günümüz göç hareketleri bölgesel gelir eşitsizliklerini azaltmakta mıdır? Göçün yaş, cinsiyet ve eğitim düzeyi bağlamında alt bileşenleri bölgesel gelir dağılımını nasıl etkilemektedir?

Ampirik çalışma 2004-2014 yılları arası Türkiye'nin 26 Düzey II bölgesini kapsamaktadır. Çok çeşitli istatistiksel araçlar uygulanmıştır. Bunlar: Tanımlayıcı İstatistikler, Mekansal Açıklayıcı Analizler, Küresel ve Yerel Moran *I* Testleri, Pearson Korelasyon Katsayısı, En Küçük Kareler Kukla Değişken Modeli, Gürbüz Lagrange Çarpan Testleri, Mekansal Hata ve Gecikme Modelleridir.

Sonuç olarak, Türkiye'de bölgesel gelir eşitsizlikleri oldukça büyüktür. Ancak, gelir eşitsizlikleri azalmaya meyillidir ve bölgeler yakınsama eğilimindedir. Artan göçün bölgesel gelir eşitsizliklerini azalttığı görülmektedir. Neredeyse tüm göç bileşenleri, farklı etki faktörleri ile gelir büyümesini olumsuz yönde etkileme eğilimindedir. Kısacası, çalışmanın özgün katkısı, yakın zamanda bölgelerin kişi başına gelir büyümesinde yakınsama eğilimini ve göç bileşenlerinin farklı etkilerini ortaya koymasıdır.

Anahtar Kelimeler: İktisadi Büyüme Kuramları, Bölgesel Eşitsizlikler, Yakınsama, İç Göç

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ABBREVIATIONS

BACH	: The rate of population with bachelor rate and above in total population
CCT	: Cumulative Causation Theory
CoV	: Coefficient of Variation
CPI	: Consumer Price Index
DİE	: State Institute of Statistics
EGT	: Endogenous Growth Theory
EU	: European Union
LISA	: Local Indicators of Spatial Association
NCGT	: Neoclassical Growth Theory
NEG	: New Economic Geography
NUTS	: Nomenclature of Territorial Units for Statistics
OECD	: Organization for Economic Cooperation and Development
OLS	: Ordinary Least Squares
PCELEC	: Per capita electricity used in industry
PCGDP	: Per Capita Gross Domestic Product
PCGVA	: Per Capita Gross Value Added
SAR	: Spatial Lag Model
SEM	: Spatial Error Model
SD	: Standard Deviation
TGYONA	: Migration and Internally Displaced Population Survey in Turkey
TURKSTAT	: Turkish Statistical Institute

CHAPTER 1

INTRODUCTION

1.1 Motivation

In the literature on regional development, the vast majority of the scholars has focused on the extent and the evolution of income inequalities across regions (Barro and Sala-i Martin, 1992; Rey and Montour, 2001; Le Gallo, Ertur and Baumont, 2003; Armstrong, 1995). The empirical literature has largely been inspired by economic growth theories, mainly Neoclassical Growth Theory that predicts the convergence of economies, under certain assumptions, to a unique steady state, equilibrium level of income (Solow, 1956; Solow and Swan, 1956).

Regional inequalities have still played an importat role in regional studies. Whether changing in the context of countries and regions, the examination of regional inequalities still is a debatable medium for policy makers, economists, and regional planners.

In the studies of regional inequalities, factor mobility has been a prominent theme to examine. However, in Turkey, far little attention has been paid to the impact of human mobility, in other words migration patterns across regions. There are also some exceptional studies belong to Filiztekin (1998), Kırdar and Saracoğlu (2008; 2012) and Kılıçaslan and Özatağan (2007). Among these few studies, the impacts of migration components have not been investigated on the income growth. The existing literature has taken the migration aggregately by ignoring the possible differential impacts of the sub-components. For instance, migration of young people from a region to another is likely to have quite different impact than the migration of working-age group. Similarly, migration of highly skilled labor is likely to have quite distinguished effects compared to low skilled labor. Therefore, sub-groups with respect to age, gender and education become crucial in this context.

The two issues individually represent quite important topics in the economics/planning literature in the last few decades. On the one hand, regional income disparities have recently been recognized as one of the most important problems. Moreover, this problem has particularly been pronounced for the developing countries.

It has been found so large asymmetries between the richest and poorest regions in developing countries such as China, India, Brasil and Transition Economies (Czech Republic, Republic of Estonia, Hungary). Large inequalities are recognized as a barrier against a sustainable development which is frequently mentioned in EU cohesion and UNDP objectives. The observed inequalities are mostly attributed to the lack of investments, infrastructure and human capital in underdeveloped regions.

Turkey is also one of the developing countries that involve sizable spatial imbalances. Such that a significant east/west dualism in income is clearly observed by many researchers (Yıldırım et al, 2009; Gezici and Hewings, 2004; 2007). However, the empirical literature has showed evidence for regional either convergent or divergent patterns in per capita income. Hence, studying this issue is not only important for the contribution to the related literature but also crucial from a policy standpoint. With this analysis; therefore, is expected to shed light on regional development policies as well.

On the other hand, in current world circumstances, human mobility has been accelerating. Advancements in the transportation facilities and international communication technologies (ICT) help mobilizing the individuals and households. Within the countries, in general, labor tends to move from low income regions to high-income areas where there exist more job incentives. Hence, the rising mobility of labor among regions is likely to change also per capita income patterns. There are two main views about it. First, the mobility will help regions equalizing the income levels. This will happen if unskilled, older and inactive population mainly migrates towards high-income regions and; thus, bring unproductive labor force in those places. Therefore, this process will reduce per capita income in developed regions while increasing it in underdeveloped areas. In contrast, if the migration happens through the movement of educated (skilled) labor from underdeveloped to rich areas, already developed regions will benefit. Hence, per capita income gap will even be extended. Since this issue is quite important, it is pursued investigating it empirically.

1.2. Problem Statement

The research questions of the study can be summarized in three main points: i. Do regional income inequalities tend to increase/ decrease in Turkey? In other words, is there a tendency of regional incomes to converge? ii. Does recent migration trend

reduce income inequalities across regions? iii. How do sub-components of migration (with respect to age, gender, education) affect regional income distribution?

1.3. Data and Research Methodology

The study is a theoretically informed quantitative research. The methodological process comprises literature review of regional growth theories, regional inequalities, convergence hypothesis (theoretical background, methods, and empirical studies), and migration based convergence issue. In the wake of literature review, the dataset preparation has been followed by the descriptive analyses, spatial configurations of inequalities, econometric analyses; spatial tests of the econometric analyses are in line.

With regard to the data collection, the variables have been obtained by TURKSTAT for the 26 NUTS II Turkish regions and for a period between 2004 and 2014. These variables are respectively, per capita real Gross Domestic Product, per capita real Gross Value Added, per capita industrial electricity consumption, university graduates/ population, net migration rate (total and for sub-groups (for child population migration (0-14), student (15-24), young adult (25-44), older adult (45-64) and senior (65+), male and female migration, low-educated, middle educated and higj-educated population migration). The migration data is available for a period 2008-2017 (the data on education starts in 2009).

By using these variables, first, descriptive and explorative analyses have been implemented. The relative values of variables (for the start and end years) have been shown in maps in order to illustrate the importance of inequalities across regions. Descriptive statistics has been shown in tables. Scatterplots and Pearson Correlation Coefficients are applied.

Two important indices, namely coefficient of variation and human mobility index have been calculated. The first one shows the evolution of regional income disparities while the second one demonstrates evolution of the degree of mobility of individuals across provinces/ regions in Turkey (also with respect to migration of sub-groups).

Second, empirical analyses have been implemented in order to reveal the convergence tendency and the impact of migration on the evolution of regional income inequalities. A panel data regression analysis (Least Squares Dummy Variable) has been carried out together with spatial error and lag models. In order to complement this

analysis, global and local Moran *I* tests and robust Lagrange Multiplier (LM) tests have been performed. Furthermore, LISA maps are generated to see the spatial similarities of regions with their neighbors.

1.4. Outline of the Chapters

This study is composed of six chapters. The first three chapters are literature part of the study. The next chapter includes the empirical study and the last chapter includes the discussion of the results and policy implications.

Chapter Two summarizes the regional growth theories and includes the theoretical frame of the study.

Chapter Three mentions the regional inequalities frm a general perspective to mention the main, critical points of the study related with the existin literature.

Chapter Four examines the international and national convergence literature and convergence studies regarding the internal migration issue. Furthermore, there is a brief section of migration history of Turkey.

Chapter Five includes the methodology and empirical study of the research with the results

Chapter Six gives the discussion of the results and suggestions of policy implications.

CHAPTER 2

REGIONAL GROWTH THEORIES

2.1. Introduction

This chapter is devoted to summarize the theoretical background framing the subject matter of the research. Therefore, the regional growth theories are necessary to be summarized with respect to growth drivers, general explanations, evolutionary processes, and their criticisms. The theories summarized in this chapter are represented in a consecutive sequence. Some theories had synchronized in history; therefore the critiques regarding one another are shared as well. The chapter includes Export Base Growth Theories, New Classical Growth Theory, Endogenous Growth Theory, New Economic Geography.

Economic growth expresses the augmentation in the production capacity providing the increase in outputs and of the income level.[1] Intrinsically, annual growth rate is a mere quantitative phenomenon, and in this sense annual growth rate indicates the increment of real national per capita income in a year, in parallel with the amount of commodity and services produced merely in the country.[2]

As stated, the amount of goods and services produced in a particular period and country indicates the annual growth of that economy quantitatively. Per capita national income, on the other hand states the development level of a country. It assists to determine the welfare level that a country achieves. The development level of developed countries substantially differs from developing countries. Annual increase in per capita gross national product in case demonstrates to what extent the production possibilities of the country are expanding. Economic growth is displayed basically by annual growth rate and ensured by the rise in the investments and implicitly savings.[3] The key determinants of the economic growth are heatedly debated in the literature. A wide range of drivers have been emphasized. While, with basic notion, Neo-Classical

[1] M. P Todaro, "Economic Development". *Addison-Wesley Publications*, Seventh Edition (2000).
[2] Muhammed Tıraşoğlu, "Türkiye Ekonomisi'nde Ihracata Dayali Büyüme Hipotezinin Yapisal Kirilmali Birim Kök ve Eşbütünleşme Testleri ile Incelenmesi". *İstanbul Üniversitesi İktisat Fakültesi Mecmuası*, 62.2 (2013): 373-396.
[3] Zeynel Dinler, "İktisada Giriş" *Ekin Kitabevi Yayınları*, 8th Edition, Bursa. (2002)

stream relies on the capital accumulation (Solow, 1956) and technological advancements, endogenous growth theories emphasize the role played by innovation (Romer, 1994), human capital (Lucas, 1988) and public investments (Barro, 1991). From another standpoint, export base growth theories focus on the importance of the external demand and trade, New Economic Geography class of theories explain the regional growth patterns via agglomeration tendencies. These theories are separately discussed in the current section.

2.2. Export Base Theory

Modern macroeconomic growth theory viewed the long-run growth that was supply oriented and assumed that factor and product price adjustments were fixed for full employment. Early export-base models found exports as a primary source of long-run growth. Preemptively, export base theory was demand oriented and substantially a Keynesian-type model, therefore its basis appeared inconsistent with national level models.[4]

In export base theory, output grows in company with increase in demand from outside the region. The necessary increases in labor and capital inputs are ubiquitous. Regional growth has occurred by virtue of new export-type industries developing within the region. Occasionally, the development without any alteration on national economy shows the shifting of productive activity from one to another region. The export theory is not a proper means to explain long-run regional change. Industries in regions with abundant input of supplies are growing associatively with exports expansion. Total regional employment (E_t) comprises of employment in the basic (E_b) and non-basic (E_n) sectors:[5]

$$E_t = E_b + E_n \tag{2.1}$$

Export base growth hypothesis asserts that increases in export through various channels promote economic growth. Increases in export affect economic growth with enhancement of efficient resource allocation, scale economies, increases in productivity, technological advances, capital formation and employment provision. Seyidoğlu (2009) points out the importance of exports for developing countries.

[4] William Cris Lewis, "A Critical Examination of the Export-Base Theory of Urban-Regional Growth". *The Annals of Regional Science*, 6.2 (1972): 15.
[5] Ibid:20- 25.

Before mentioning on the export base model the related theory of development stage is addressed. The development stage and export base theories have closer links with production and location theories. Development stages theory founded largely on the empirical studies of C. Clark and A. Fisher and has a refined scheme by dismantling the stages and incorporating items from the location theory of the industries.[6] It puts forth that there is a move from subsistence to the development of specialized commercial types of agriculture. Eventually intra-and interregional trade in agricultural products is needed.

Addition to the trade relations in terms of agricultural products, locational factors tend to contribute to the development of secondary production based on raw materials obtained from the region and (/or) other regions. And when the economy matures, tertiary industries develop which may export part of their total services to other regions. This process refers to stages of development.[7]

North (1955) criticized the stage theory because the perspective of stages was largely inconsistent with the real world and was unable to assert why regions grew in stages. In place of this, he demonstrated that many regional economies derived from the very beginning as export economies and built their development around the export sector.[8]

When heading for the export base model that originated on the studies of economic historian H. Innis (1920) and efforts by D. North (1955) and C. Tiebout (1956), the model drives forward the relation between foreign trade and economic growth. Encouraging exports of the commodities produced in national borders affect economic growth positively. Awokuse (2005) epitomizes the effects of export on growth in three aspects. [9] Firstly, export is an impetus for aggregate output. Further, it is effective on growth due to efficient resource allocation, economies of scale, and lastly with the import of capital and intermediate goods, increase in capital formation under favor of foreign exchange triggers output growth.

Armstrong and Taylor (2006) state that North (1955) pointed out that the regions acted with the demand for the products being produced locally in the region and being

[6] M., D., Thomas, "The Export Base and Development Stages Theories of Regional Economic Growth: An Appraisal." Land Economics, 40 no. 4 (1964): 421-432.
[7] Harvey Armstrong and Jim Taylor "Regional Economics and Policy". 8th Edition, Blackwell Publishing. (2006)
[8] D. C. North, "Location theory and regional economic growth". *Journal of Political Economy*, 63.3 (1955): 243-258.
[9] T. O., Awokuse, "Export-led growth and the Japanese economy: evidence from VAR and directed acyclic graphs". Applied Economics Letters, 12(2005): 849–858.

exported beyond the borders of regional market. The approach furthermore explains how regional specialization occurs and how regional economy grows or declines.

In consideration of Tiebout's criticism, North (1955) explicitly recognized the value of the theory in explaining long-run economic growth.[10] The economic growth hinged on the growth rate of growth of export sector, and relatedly its generative effect hinged on the non-export or residentiary industries i.e. tertiary. There were also direct and reciprocal relationships among the sectors.

Export base theory was developed with different emphasises and points of view. The advanced versions of Export Base Theory were Cumulative Causation Theory (CCT), Growth Pole Theory and Kaldor's Laws.

Cumulative Causation Theory mainly states that regions grow cumulatively and widen the gap between the less developed backward regions. The mechanism works through exports demand and trade. Once a region receives higher external demand for its products, it increases its production, which brings specialization and productivity growth. Then, reaching a certain competitiveness level, the region lowers the export prices that lead a more demand for its products. This circle continues that provides high-income growth for the export-based and less growth for the backward region.

Based on the first seeds of the theory mentioned above, the works of Gunnar Myrdal (1957) are approved the basis of CCT. He disputed that the principle of increasing returns to scale brought about clustering within the regions which were first to industrialize. Additionally, growth actualized along the process of circular cumulative causation with the advantages of low-wage labor and agglomeration economies. The former was ensured from underdeveloped regions, and the latter was found in the industrialized regions. Dawkins (2003) states that free trade between regions also brings associatively prosperity to underdeveloped regions through spread effects, by the means of innovation diffusion. In the lagging regions, growing export markets emerged nonetheless the prosperity would therewithal increase in the developed regions through backwash effects that occurs as the flow of capital and labor from lagging to developed regions.

Casey (2003) states that the effects comprised by these trade relations were firstly defined by Myrdal with the two concepts suggested as "backwash and spread effects".

[10] M., D.,Thomas, "The Export Base and Development Stages Theories of Regional Economic Growth: An Appraisal". *Land Economics*, 40.4 (1964): 428.

Fujita (2007) mentions Myrdal's two important factors including institutional and political dimensions.[11] These are related with his explicit value premises one of which is equality. On behalf of decreasing inequalities, CCT was carried out for the developed and underdeveloped countries. CCT meanwhile had theoretical implications in explaining the divergent process. But Myrdal (1957) did not disclaim the prospect of convergence.[12]

Associated with the developed regions, Kaldor (1970) fostered Myrdal's theory by affiliating ideas from export base theory by adding the concept of efficiency wage on. Similar to Myrdal, Kaldor supported increasing returns to scale provided the advantage for regions that were early industrialized.

Myrdal (1957) introduced the principle of circular and cumulative causation with the examination of certain regions that industrialized highly than others. Cumulative causation Theory depends upon the increasing returns to scale. The cumulative advantages that are know-how, easy sharing of ideas and experience, specialization in human activities are based on the growth of industry.[13]

In addition to Cumulative Causation Theory, Growth Pole Theory is an advanced version of the former which is placed within a spatial context. The theory was developed by F. Perroux (1955) who concerned with the economic development and the structural change. Further he defined space as "a type of network".

The idea of the poles lies behind the concept of centers and areas of economic activities. The enterprises have become the attraction poles of production factors. The growth pole effect further has led concentration of growth occurring in the poles.[14] According to the Growth Pole theory, economic growth occurs in poles which are possibly multiple and in different parts of the regions/countries. Due to the availability of natural resources, labor pool and similar kind of dynamics trigger the existence of these poles.

The view of spatial interaction in the form of centripetal forces underpinned the growth pole theory. Perroux (1955) explained a growth pole by referring to the linkages between firms and industries. Onward firms relatively larger than other firms achieved

[11] Nanako Fujita, "Myrdal's Theory of Cumulative Causation" Evolutionary Inst. Econ. Rev. 3.2 (2007): 275- 283.
[12] Ibid, 278.
[13] Nicholas Kaldor, "The Case for Regional Policies", *Scottish Journal of Political Economy* (2013): 481-491; reprinted from *Scottish Journal of Political Economy*, 17: 337–348.
[14] Viktor Komarovskiy and Viktor Bondaruk, "The Role of the Concept of "Growth Poles" For Regional Development", *Journal of Public Administration, Finance and Law* 4(2003): 31- 42.

induced growth by virtue of inter-industry relationships in the process of growth expansion. Hirschman (1958) argued how polarization advanced both the growing region and its hinterland.

Similar to Myrdal's "spread/ backwash effects", As Casey (2003) states that Hirschman disputed that growth in developed regions caused favorable "trickling down effect" in lagging regions. However, due to competition and trade barriers, unfavorable polarization effect might occur.

Hirschman (1958) with a comparison of his and Myrdal's approaches, argued that emergence of strong forces would determine polarization for a while where trickle-down effects would exceed polarization effects with the economic policies to annihilate the latter. Including the components of unbalanced regional growth theory of Myrdal and export base theory, Friedmann (1967) put forth a center-periphery model and discussed the role of local actors depicting the growth trajectory of a region.

Lastly, Kaldor aimed to theorize an income distribution by using Keynesian means, especially multiplier effect. Notwithstanding he used the Keynesian means and his model is known as an advanced form of Harrod-Domar growth model.[15] Based on the Harrod-Domar growth model, the only factor of production is capital, and free foreign trade has positive impact on economic growth.

The model is a long-run balance theory approaching economies in full employment where growth is associated with exogenous variables such as population growth, technical progress.[16]

Kaldor discussed Solow's model because he found the model insufficient to explain endogenous technological progress and demand sided long run explanations might be proper. Kaldor has an inductive approach based on three laws. Firstly, growth in Gross Domestic Product (GDP) is related with manufacturing industry being the engine of economic growth.

Secondly, in manufacturing industry, growth in output is strongly associated with growth in labor productivity i.e. known as Verdoorn Law subject to principles of economies of scale and increasing returns to scale.

Lastly, increase in growth rates of manufacturing ensures growth in productivity as well.

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[15] Erdoğan Alkın, "Keynesyen Gelir Dağılımı Teorisi ve Kaldor Modeli".*İktisat Fakültesi Mecmuası* (1969): 13 159.
[16] Ibid, 134.

2.3. NeoClassical Growth Theory

Solow (1956) and Swan (1956) developed the Neoclassical Exogenous Growth Theory in the wake of Harrod and Domar. NCGT has been the most outstanding theory among the growth theories. Its prominence is subject to its general regional production function that embodies substitutability of production inputs. As Barro and Sala-I Marin (1992) states that it assumes positive elasticity of substitution among inputs and constant returns to scale. The production function includes neoclassical characteristics written in the form as:

$$Y_t=F(K_t,L_t) \tag{2.2}$$

Y is the total production (real income); K is the total stock of physical capital of the economy; L is the labor in the economy, t is the time. In this function, capital and labor are diminishing marginal productive. This equation also corresponds to Cobb-Douglas production function.

Contrary to Export Base Theory, NCGT has a supply-side perspective placing investment into high capacity areas in the closed economy. Early narratives of this theory excluded the determination of parameters such as savings rates, population growth rates, and technological progress, mentioned as exogenous growth theory. Neoclassic growth model assumes labor in finite supply, and declining marginal productivity of capital.

The main prediction of the neoclassical model is that under certain assumptions, income grows at a positive rate until it reaches a long-run stable equilibrium. At the steady state per capita income growth is zero unless a technological progress occurs. From a regional standpoint, under the assumption that regions have identical saving rates, population growth and same technology levels, each region will converge to a unique steady state (equilibrium) due to the fact that return of capital diminishes over time. Hence, each region is expected to equalize the level of per capita income, which is called absolute convergence.

Neoclassical Growth Theory, an extension of Harrod-Domar and Solow models, remarks that a country with a closed economy i.e. no external activity and a low saving grows more slowly than the country with higher saving rates. But a country with an open economy, thanks to trade and foreign capital can reach higher income levels and

the wealthy countries level because capital flows from rich countries to poor countries with low capital/labor ratio and higher investment returns.[17]

Moreover, in a closed economy a single composite good is produced that corresponds to both consumption and investment means. It is approved that there is no impacts of trade on economic growth in closed economies. The effects of foreign trade on economic growth in closed economies opening to foreign countries are admitted temporary. The foreign trade causes increase in the output level; nevertheless it could not change steady state growth rate.[18] In the production, as two basic inputs physical capital and labor are used. As is the case with labor and capital markets, there are no demand and supply surplus. Individuals spend their incomes in consumption and investment goods. Saving-investment equilibrium is ensured for each reel income level. This is also the condition that allows the model to be a long run equilibrium model.[19]

In the Solow-Swan model, individuals convert a fixed part of their income into savings, which turns into an immediate investment in the capital market. In the Ramsey-Cass-Koopmans model, individuals make consumption-saving choices by maximizing social benefits. In both economies, the saving-investment balance occurs ex ante ex post.[20]

Solow (1956) in his study of "A Contribution to the Theory of Economic Growth" developed a long run growth by accepting Harrod-Domar assuptions except the fixed proportions. For him, substituting labor for capital was not possible in production. He worked out to adapt the model to an exogenously given rate of increase of the labor force, analyzed the price-wage interest and allowed neutral technological change to relax the rigid assumptions.

The Solow model was criticized essentially at three points. Firstly, technological progress was exogenous as technical progress was added to the model that promoted per capita growth in the long run. Secondly, exogenous variable of savings/investment determined the level of steady states of countries to reach. Ultimately, human capital was not incorporated in the model.

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[17] İsa Sağbaş, "Türkiye'de Kamu Harcamalarının Yakınsama Üzerindeki Etkisi", *Afyon Kocatepe Üniversitesi, İ.İ.B.F. Dergisi* 4.2.(2002): 137- 148.
[18] Ramon Lopez, "Trade and Growth: Reconciling the Macroeconomic and Microeconomic Evidence". Journal of Economic Surveys 19.4. (2005): 623- 648.
[19] Türkan Turan, "Neoklasik Büyüme modeli ve Koşullu Yakınsama Hipotezi" İ.Ü. İktisat Fakültesi, Maliye Araştırma Merkezi Konferansları, 39 (2001): 129- 143.
[20] Ibid, 133.

When examining the relation of growth model with convergence, under favor of the Solow's model, it is predicted that conditionally convergence of growth rates is ensued in time across countries. If the growth rates are same among countries, the theory indicates absolute convergence in per capita incomes and convergence clubs but remains incapable of explaining divergence.

In general, Neoclassical Growth Theory with diminishing marginal productivity of capital and technological stability in all countries implies that underdeveloped countries or regions would converge to developing countries or regions. As Yeşilyurt (2014) states that The interest on the convergence issue has been increased with the adaptation of economic policies of countries, along with globalization.

Additionally, the reasons of interregional convergence are pointed as factor mobility and capital stock.[21] Austin and Schmidt (1998) stated that the theoretical cause of convergence is diminishing returns of capital. Regions with initial low capital starting to use higher rate of capital gain higher returns. For further production, capital has to be used with human capital.

When low-qualified or unemployed migrants migrate, per capita income and production in out-migration regions are increasing. In in-migration regions returns of capital are decreasing while in out-migration regions returns are increasing.[22]

To mention on the effects of public spending on growth, it is explicitly expected that public spending contribute economic growth. Particularly, public spending in low income regions promote more on growth rate relative to richer regions convergence is supported in a positive manner. However, the causal relation may not be advocated absolutely because of two reasons. Primarily, commodities and services ensured by private sectors may be more effective than the services provisioned by public sectors.

Secondly, tax collection for financing public spending may result in loss in public sector. The empirical studies done in developed and developing countries show that there is any strong relation between total public spending and economic growth. Additionally, it is asserted that spending for increasing physical and human capital e.g. education and social expenditures, have the strongest effects on economic growth.[23]

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[21] Harvey, Armstrong and R. W., Vickerman, "Introduction", in Harvey Armstrong and R.W., Vickerman. (eds) Convergence and Divergence Among European Regions, European Research in Regional Science 5, Pion Limited, London, 1995: 10.

[22] John.S. Austin and James R. Schmidt, "Convergence amid Divergence in a Region", *Growth and Change*, 29.1(1998): 69.

[23] İsa Sağbaş, "Türkiye'de Kamu Harcamalarının Yakınsama Üzerindeki Etkisi", *Afyon Kocatepe Üniversitesi, İ.İ.B.F. Dergisi* 4.2.(2002): 140.

In pursuit of the premises, Borts and Stein (1964) altered the neoclassical exogenous growth theory for the regional scale by incorporating open regional economies with net exogenous labor and capital inflows. In other words, they considered interregional factor mobility while neoclassical growth models generally assume intraregional factor mobility.

Williamson (1965) supervened on and amended their claim with a highlight of the condition why interregional convergence is more probable while approaching the developed phase of nation.[24] Williamson (1965) added some further points for indicating possible convergence in the later stages of nations.

Labor migration rates in underdeveloped nations are unequal because of the migration costs. Capital flows may be disrupted by external economies of scale and immature capital markets. Biased attitudes of central government may occur toward regions. In the early phases of national growth progress there may be weak interregional linkages.[25]

His emphasis has been quite related with the development level of the country to achieve interregional convergence. Supporting this idea, Barro and Sala-i-Martin (1992) found that highly mobile production factors within regions resulted in interregional convergence.[26]

Neo Classical Growth Theory has been the chief theory that has been heavily criticized and new theories have been developed on its general facts.

2.4. Endogenous Growth Theory

In Neoclassical growth model, there was a balance but there would be no economic growth if there were no technological innovations. There was labor in the model; however, there was no human capital of labor. Especially from 1950s, the importance of technological innovations has been increased, from 1960s, the concept of skilled labor has been considered important. In the wake of neoclassical growth theory, new approaches endogenize technological innovations and extend the definition of capital by incorporating human capital.[27]

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[24] Casey J. Dawkins, "Regional Development Theory: Conceptual Foundations, Classic Works, and Recent Developments" *Journal of Planning Literature*, 18.2 (2003): 136- 138.
[25] Ibid, 139.
[26] Robert Barro, and Xavier Sala-i Martin, "Convergence". *The Journal of Political Economy*, 100.2 (1992): 223- 251.
[27] Hasan Gürak, "Ekonomik Büyüme ve Kalkınma: Kuramlar, Eleştiriler ve Alternatif Bir Büyüme Modeli" Ankara: Nobel Akademik Yayıncılık, (2016): 91- 94.

Since the 1980s, new growth models have been developed that endogenize the qualification of labor and technological innovations. Associatively, approaches have emerged that include variables such as knowledge, human capital, research and development (R& D), technological development, and the role of government that affect economic growth. Romer (1986) and Lucas (1988) state that growth does not depend on external factors but is an endogenous result of functioning economic system. The way of adding important components into model triggers to name it as Endogenous Growth Theory (EGT) that emerge as an answer to the inadequacies of the neoclassical growth theory and as a reaction to the assumptions it revealed. In this part, AK growth model of Rebelo (1991), learning by doing model of Arrow (1961), human capital model of Lucas (1988), and R&D model of Romer (1994) are reviewed.

To start with, the AK growth model of Rebelo (1991) provides a transition between the Solow model and the endogenous growth models. If the production function is not appropriate to the requirements of the neoclassical approach, the economy could not reach to steady state; however there is no steady state of income in EGT. Although countries have the same savings and growth rates, per capita income differences between countries can be constant. In AK growth model the assumption of constant return to scale is maintained. Assumption of constant productivity replaces the diminishing marginal productivity.[28]

Lucas (1988) in his model regarded human capital accumulation as the positive externalities put forth by Romer. According to Lucas, economic growth is emerged as a result of the investment in human capital which is acknowledged as a production factor similar to physical capital. He developed three models encompassing a model emphasizing physical capital accumulation and technological change, a model emphasizing human capital accumulation through schooling, and a model emphasizing specialized human capital accumulation through learning-by-doing.[29]

In the first model, Lucas (1988) criticized the exaggeration of technological innovations in neoclassical models, which ignored other important factors. He also emphasized the importance of human capital being for increasing productivity. In the

[28] Sergio T. Rebelo, "Long-Run Policy Analysis and Long-Run Growth," *Journal of Political Economy*, 99.3(1991): 500–521.
[29] Robert E. Lucas, "On the Mechanics of Economic Development*" *Journal of Monetary Economics*, 22 (1988): 3.

second model, he added human capital for the provision of a complementary character into the technological innovation approach.[30]

However, the model had not the capacity of explaining the dynamic growth process neither globally or in a country. The third model introduced specialized human capital accumulation with referencing to the concept of learning by doing.

In its origin, Arrow (1962) established a growth model showing the relation between technology and total capital stock. He referred to the airframe industry and found out strong interrelation between productivity growth and experience. A change in experience depended on investment which cumulatively represented the stock of human capital.[31]

The assumption of by-product of investment validates knowledge an endogenous variable.[32] In the Arrow model, technological development has been endogenised by incorporating learning by doing into model. In this model, the emergence of technological development is explained by the externalities ensued by investments. The increasing return in case is due to learning by doing. In time, because of learning by doing the quality of the product and production accelerates over time. Technological development in the model is included in learning and it is assumed that there is no cost of learning. Investments made by enterprises increase the capital stock and hence the level of knowledge in the economy. Technological development has made Cobb-Douglas function with the constant return to scale into a function of increasing returns to scale.

Lucas (1998) articulated that in a closed economy, a poor country maintains its relative poverty even though having the same growth rate with a rich country. When the labor factor is mobile among countries, the effect on foreign trade depends on the endogeneity and spillover effect of human capital that increases labor productivity. In a country where human capital is high, labor at every skill level is paid higher due to increased productivity. Due to the wage differentials between poor and rich countries, migration occurs in the direction from the former to the latter. As in poor countries the development is hindered, in rich countries stagnation is avoided. Countries with a weak

[30] The contribution of human capital is partially because technological innovation already reserves the knowledge in itself.
[31] Kenneth J., Arrow, "The Economic Implications of Learning by Doing." Technical Report No. 101 (1961): 1- 30.
[32]Alfred Greiner, “Endogenous Growth Cycles- Arrow's Learning by Doing Reconsidered*”,]*ournal of Macroeconomics,*18.4(1996): 587- 604.

human capital but enough domestic market size lose labor to the countries with higher human capital.[33]

Lucas (1998) spoke of convergence and said:

> Economies that are initially poor will remain poor, relatively, though their long-run rate of income growth will be the same as that of initially (and permanently) wealthier economies. A world consisting of such economies, then, each operating autarchically, would exhibit uniform rates of growth across countries and would maintain a perfectly stable distribution of income and wealth over time.[34]

The body of endogenous growth models was extended with the contribution of Romer (1986) who opened up new dimension to the growth theory.[35] He negated the archaic neoclassical growth models with static equilibrium. For him, the use of new technologies (the products of human capital) ensures the increasing returns to scale for all factors. Investment productivity in capital goods prevents decreasing productivity of capital accumulation because labor force is defined as capital and used in production of knowledge. The human capital (H) is included into the model where the two components of knowledge are human capital and technological innovations. Human capital is measured with the numbers of formal education and education years on-the-job. Technology level is measured with the number of designs.[36]

Gürak (2016) states that different from the earlier growth model, there are research, intermediate goods, and end product sectors. In R&D sectors, for production of new knowledge, human capital and knowledge stock are used. In intermediate goods sector, in consideration of new knowledge gained through R&D sector, goods are produced for use in the production of end product. In the end product-sectors, existing capital goods, labor and human capital are used for the final revenue which is either consumed or canalized as saving for new capital.

New knowledge is provided with the allocation of labor, capital amount and technology level into research. In knowledge production, labor and capital are constant returns to scale, in R&D with diminishing returns to scale.[37]

The economic growth rate depends on the research inputs, technological innovations, new products (designs). Romer (1994) explains this idea with three hinges:

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[33] Robert E. Lucas, "On the Mechanics of Economic Development*" *Journal of Monetary Economics*, 22 (1988): 3- 42.
[34] Ibid: :39.
[35] Paul M. Romer, "Increasing Returns and Long-Run Growth" Journal of Political Economy, 94.5(1986): 1002-1037
[36] Paul M. Romer, "The Origins of Endogenous Growth". *The Journal of Economic Perspectives*, 8.1 (1994): 3-22.
[37] Hasan Gürak, "Ekonomik Büyüme ve Kalkınma: Kuramlar, Eleştiriler ve Alternatif Bir Büyüme Modeli" Ankara: Nobel Akademik Yayıncılık, (2016): 111- 114.

technological development is the main dynamic of growth, new information is used in the production of a new commodity that can create market value, and it generates cost once, while producing information used in the production of a commodity.

2.5. New Economic Geography

New Economic Geography models have been developed as a set of new trade theories in the late 1970s and 1980s. These models try to explain intra-industry trade and predominance of trade flows. With a focus of industries attributed by economies of scale and imperfect competition, the new trade theories are able to clarify the competitive advantages of regions or countries.[38] New Economic Geography (NEG) predicts the forces and how these forces lead to emerge of industry clusters. He compounds external scale economies, increasing returns of scale with interregional trade approach. Inspired by the studies of Dixit and Stiglitz (1977), Krugman outlines a core-periphery model i.e. different from center-periphery model of Friedmann. Under the centrifugal and centripetal forces, regional economic clusters occur.[39] Centripetal forces are the opportunities for employment, education, high living standards while the centrifugal forces are the idle labor power in the countryside due to mechanization in the agriculture. The core-periphery model determines a core where the manufacturing is located and a periphery with agricultural production. The main prediction of the theory suggests that agglomeration will occur as long as centripetal forces exceed the centrifugal forces that create positive externalities on the regions (such as sharing same infrastructure, labor pool, low transportation costs, knowledge diffusion etc.) that will create increasing returns to scale and regional growth.

Krugman (1991) develops a model showing a country that endogenously differentiates into an industrialized core and an agricultural periphery.[40] Based on the models, manufacturing firms tend to locate in the region with larger demand, but the location of demand itself depends on the distribution of manufacturing. Emergence of a

[38] Harvey Armstrong and Jim Taylor "Regional Economics and Policy". 8th Edition, Blackwell Publishing. (2006): 135- 136.

[39] "On the one hand, firms with strong scale economies will serve national markets from a single location. To minimize the cost of delivering goods to market, firms will choose locations with a large local demand. This, in turn, is most likely to be where industries have already located, because firms desire to be close to their workers", cited in Casey J. Dawkins, "Regional Development Theory: Conceptual Foundations, Classic Works, and Recent Developments" *Journal of Planning Literature*, 18.2 (2003): 148.

[40] Paul Krugman, "Geography and Trade".(1991.) Cambridge, MA: MIT Press: 487.

core-periphery pattern is bound up with transportation costs, economies of scale, and the share of manufacturing in national income.

Primarily, NEG represents the spatial dimension of regional growth and trade.[41] Krugman (1999) intimates two approaches examining the role of geography. One of which emphasizes on geographical factors such as climate and topography.

On the other hand the patterns without apparent geographic differences are considered. Furthermore, large persistent effects of different geographic features across regions are reviewed.[42]

About the convergence issue, NEG indicates that the incomes of the regions depend on the distribution of workers and their wages. To exemplify, it is apparent that if wage rates in the two regions are equal, workers move from region II to region I. That labor mobility will lower the price index in region I; and thus raise real wages in region I relative to those in region II. This is an additional cause for divergence.[43]

Krugman (1998) sorts the forces affecting geographical concentration as: market-size effects (linkages), thick labor markets, pure external economies are centripetal; and immobile factors, land rents, pure external diseconomies are centrifugal forces. Core-periphery theoretical work in the new economic geography has two lines.

One has been an effort to build links from the new genre to traditional questions of location theory. The other has been an effort to use the genre as the basis for a new, spatial view of international trade. [44] [45]

These growth theories discussed in this chapter gives a background of the study and provides a theoretical frame. The study is designed on the critiques of Neo Classical Growth Theory that ignores the factor mobility. Furthermore, Neo Classical Growth Theory does not pay attention the human flows in terms of economic growth and development process. Indeed, factor mobility including both the capital and labor mobilites has been a significant factor for decreasing the regional inequalities.

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[41] Masahisa Fujita and Paul Krugman, "The new economic geography: Past, present and the future", *Papers Reg. Sci.* 83(2004): 139- 164.
[42] Paul Krugman, "The role of geography in development". *International Regional Science Review* 22.2 (1999): 142-61.
[43] Paul Krugman, "Increasing Returns and Economic Geography" Journal of Political Economy, 99.3(1991): 491-492.
[44] Paul Krugman, "What's New About the New Economic Geography?" Oxford Review of Economic Policy, 14.2(1998): 8
[45] Ibid, 13.

CHAPTER 3

REGIONAL INEQUALITIES

Income inequality is shown as the share taken from the gross domestic product by the groups defined in specific ratios e.g. Gini coefficient. The unfair distribution of income has occurred between countries and surely within countries as well.

Sala-i-Martin (2002) seeks to estimate the evolution of global inequality across individuals of the world. He combines across-country inequality measures such as the population-weighted variance with the within-country measures. He reveals that the measures of convergence based on "each country, one data point" differs from the condition of "each citizen, one data point". He explains the trouble of ignoring intra-country inequality by giving Chinese example. Beside its spectacular growth process i.e. converging towards the levels of OECD economies, Chinese economy has not benefitted all citizens equally.[46] He emphasizes the importance of measures differed for within country and across country.

Furthermore, a large number of studies show that the countries experiencing inequalities have had weak economic growth rates. Countries consistently grow at different rates. In this vein, Partridge (1997) proposes that greater economic inequality reduces future economic growth.[47] Inequality at the subnational level refers to differences between the citizens of a country. The rise of inequalities rarifies the applicability of policies to straighten the inequalities and causes frailty of political structures.[48]

Income inequality refers to disparities in the distribution of income. The review of a large number of studies on economic growth and income inequality, Shin (2012) concludes that there are different associations between economic growth and income inequality.[49] (Table 3.1)

[46] Xavier Sala-i-Martin, "The Disturbing "Rise" of Global Income Inequality", *NBER Working Paper Series*, 8904 (2002): 8- 9.
[47] M. D.,Partridge, "Is Inequality Harmful for Growth?" *The American Economic Review*, 87.5 (1997): 1019-1032.
[48] A. McKay, "Inequality Briefing" Briefing Paper No 1, (2002).Overseas Development Institute and University of Nottingham.
[49] Inyong Shin, "Income inequality and economic growth". *Economic Modelling* 29(2012): 2049–2057.

The saving rate of high income groups is higher than of low-income in developed countries. Redistribution of national income may lead to a decrease in economic growth. On the contrary, in developing countries, low income groups are unable for investments. Income inequality may cause political and social instability resulted in decline in economic growth.[50]

Table 3.1. Studies about income inequality and economic growth (source: Shin, 2012: 2050).

Relationship	Studies by
1) Negative	Murphy et al. (1989), Perotti (1993), Alesina and Rodrik (1994), Persson and Tabellini (1994), Perotti (1996), Alesina and Perotti (1996), Acemoglu (1997), Helpman (2004), Tachibanaki (2005), Sukiassyan (2007), etc.
2) Positive	Okun (1975), Bourguignon (1990), Benabou (1996), Li and Zou (1998), Aghion and Howitt (1998), Forbes (2000), etc.
3) Inverted U	Chen (2003) etc.
4) Not unique or inconclusive	Amos (1988), Barro (2000), Banerjee and Duflo (2003), Weil (2005), Shin et al. (2009) etc.

In a more general manner, two main concerns about the notion of inequality come to the fore. First one is the question "inequality of what", and the second one is "how are conditions compared with respect to inequality". The former indicates an ideal world of fair and equal share of welfare, opportunity, primary goods, etc. The second intimates the complaints of whom, and the seriousness of the complaints. Temkin (1993) argues that inequality is complex, individualistic, and essentially comparative. Related with the two concerns, he focuses on comparative expression of inequality: Is worse-off than betters is better than worse-off than average? "Being worse" does not declare the absolute worse situations. At this point, the ideal world corresponds to the average level of welfare.[51]

Inequality plays a prominent role in political arguments. Its nature and complexity need to be ascertained. In an unfair world, there have been many differences and deep contradictions of societies in the context of development levels, opportunities, socio-economic indicators. Inequalities have been investigated to speak of the differences and in a large medium have been studied both theoretically and empirically.

[50] Ibid: 2050.
[51] Larry Temkin, "Inequality". Oxford University Press, (1993).

Income distribution is purposive to explain the income division among individuals, social groups, and production factors in an economy at a time. Additionally, it enables to unveil the social and political structure of the society. There are means of measuring income distribution. Functional income distribution indicate the shares of wage, interest, rent, profit in national income, and shows how the national income is divided into the factors of production. Per capita income distribution will be mentioned in further chapters related with convergence hypothesis. It is helpful to find out the development differences between regions.

In addition, factor mobility, reference to growth theories, is a means to balance the regional inequalities. Factor mobility includes the capital and labor flows between the regions that may provide an economic balance in the long-run. People are moving from low-wage to high-wage regions while capital is moving to regions with cheaper labor force. In context of the study, the capital mobility has been excluded while the labor mobility has been embraced as migration movements.

CHAPTER 4

CONVERGENCE AND MIGRATION

This chapter includes the detail evaluation of convergence hypothesis with examples of empirical studies either international or Turkish, and its relatedness with migration issue. Furthermore, there is a section summarizing the migration theories and selective Turkish migration studies to reveal the migration history of Turkey.

To start with, convergence has its origins in the late 1950s. Neo-Classical Growth Theory (NCGT), in general circumstance assumes that diminishing returns lead to convergence. Studying on a large number of countries put forth that NCGT models were unable to generate long-term growth. Islam (2003) appraises the convergence literature aggregately by embracing the convergence issue with the growth theories.[52] The critical question has been why area economies i.e. economies of countries, states, regions do converge. Formal theoretical development of the convergence is a prediction from the neoclassical growth model.

The theoretical driver of convergence has been based on diminishing returns to capital with also inclusion of human capital. While higher levels of activity and income extend the limits of production, rates of return to capital decrease. Areas with initially low endowments of per capita capital can expand the use of capital and experience higher rates of return. The basic narrative of convergence is approaching economies in a reverse relation.

With the global dynamics, economies become less production-based that is why it becomes more important to incorporate human capital into the capital stock. Highly skilled service-based labor force can move to attractive markets with little consideration of physical capital. That is exteremly different from resource-based production where the location of fixed stock may lead the location decisions.[53] Furthermore, a major mechanism promoting convergence is population movement. If a highly skilled individual in a rural area has opportunities for higher income in large metropolitan areas, that person may migrate.

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[52] Islam, N., "What have we learnt from the convergence debate?" *Journal of Economic Surveys*,17.3 (2003): 309- 362.

[53] Barro, R. J. and X. Sala-i Martin. "Convergence across States and Regions" *Brookings Papers on Economic Activity*, 1(1991):107- 182.

In areas of outmigration, increases in per capita physical capital occur through the departure of outmigrants, improving the returns to capital. In areas where outmigration occurs and where outmigrants are low skilled, unemployed, or underemployed, per capita output and income can increase because of their outmigration.[54] It can be stated that transfer of low-productive labor force causes betterment in per capita output.

Correspondingly, even though the output of migrants and income may rise in their new area as compared to their old area, per capita output and income in the new area can be reduced if the skills brought to the new area are lower than the average of the established workers in the area. The areas the low-skilled migrants move into are able to increase total production from an enlarged workforce, even though the inmigrants may earn less than the average per capita income for the area they move into and thus lower overall per capita income.[55] It may be explained that transfer of low-productive labor brings impediment in per capita levels in in-migration areas.

In these regards, Lucas (1988) examines the attractiveness and dynamics of areas. Movement in response to opportunity is not restricted to the highly skilled. The movement of American blacks from the rural South to northern cities in this century was a movement of low skilled workers with low levels of educational attainment.[56] Migrants who move are generally leaving areas where the market for their services is characterized by low demand and often very low wages.

Beside the theoretical drivers of convergence, its variations based on its context are mentioned. Convergence may occur within an economy or across economies. It may be measured in growth rate, income level, and total factor productivity. Islam (2003) mentions that convergence has a number of types such as; β (Beta), σ (Sigma), absolute, conditional, global, local (club) convergences. Furthermore, it may be deterministic or stochastic.[57] On the other hand, convergence may be classified according to the use of different methodologies. Convergence has been addressed with informal cross-section, formal cross-section, panel, time-series and distribution approaches.[58]

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[54] John S. Austin and James R. Schmidt, "Convergence Amid Divergence in a Region". *Growth and Change*, 29 (1998): 69.
[55] Ibid: 70.
[56] Robert E. Lucas, "On The Mechanics of Economic Development". Journal of Monetary Economics 22 (1988) 3-42.
[57] Nazrul Islam, "What have we learnt from the convergence debate?"*Journal of Economic Surveys*, 17.3 (2003): 309- 362.
[58] Ibid: 312.

Early studies in regional convergence were rooted in Easterlin (1960) and Borts and Stein (1964). These studies focused on Sigma convergence, that is, whether the dispersion of per capita incomes or outputs across areas decreases over time. Coughlin and Mandelbaum (1988) Sherwood-Call (1996) analyzed Sigma convergence patterns across the U.S. states and documented a divergent trend during the 1980s.[59] [60,]

According to Sala-i-Martin (1996), β and σ indicators are new tools for measuring the degree of convergence and the speed for getting convergence. While β parameter shows the speed for accomplish the convergence when it has a negative sign, σ indicator shows the convergence and divergence tendency depending on the value of sample variance.[61]

The concept of σ-convergence refers to Neoclassical Growth Theory. The existence of σ-convergence depends on the decrease in variance of logarithm of real per capita Gross Domestic Product among economies in time. It is mentioned further as catching up effect.[62]

When considering Beta and Sigma convergence, the former describes the tendency for economies with low per capita incomes in an initial period to grow faster than those with higher incomes. On the other hand, the latter describes the tendency for the dispersion of incomes to fall over time and eventually stabilize.[63]

The outstanding studies of Barro and Sala-i-Martin (1991; 1992) including the study of Mankiw et al (1992) focused on the increasing interest in the subject of convergence. Mainly, they are concerned with Beta convergence.[64] Beta is the parameter in the neoclassical growth model that governs convergence, that is, the speed with which per capita incomes approach steady-state level. Beta, numerically, is the proportion of the difference between current and steady-state per capita incomes that is made up in one time period, usually one year. As Austin and Schmidt (1998) state that there are two forms of Beta convergence, heavily addressed in the literature, absolute and conditional. The former determines the same steady states across areas while the

[59] C.,Sherwood-Call, "The 1980s divergence in state per capita incomes: What does it tell us?" Ec*onomic Review*, Federal Reserve Bank of San Francisco, 1(1996): 14-25.
[60] C. C., Coughlin, and T. B. Mandelbaum, "Why have state per capita incomes diverged recently?", *Economic Review*, Federal Reserve Bank of St. Louis, 70(1988).: 24-36.
[61] Xavier, Sala-i-Martin,"Regional Cohesion: Evidence and Theories of Regional Growth and Convergence". European Economic Review 40, (1996): 1325–1352.
[62] Mihaela Simionescu, "Testing Sigma Convergence Across EU-28". *Economics & Sociology*, 7.1 (2014): 48-60.
[63] Economically stabilization refers to reaching to same steady state of states, regions in the same country.
[64] Mankiw, N. G., D. Romer and D. N. Weil, "A contribution to the empirics of economic growth." Quarterly Journal of Economics, 107.2, (1992): 409-437.

latter allows for the prospect of different states. Under the hypothesis of conditional convergence, areas that are far below their steady-state position will grow faster than areas that are closer to their steady-state position.

Barro (1991) examined the prospect of convergence across 98 countries between 1960 to 1985 and found that initially low per capita income countries do tend to catch up with initially high per capita income countries if the poor countries have high per capita human capital.[65]

Furthermore, Barro and Sala-i-Martin (1991) investigated Beta convergence among regions of European countries, regions of Japan, among groups of countries, and among the states of the U.S. For the European counries, they found that similar rates of Beta conver-gence are consistent with the data.[66] In another study, Barro and Sala-i-Martin (1992) found a positive and significant estimate of Beta close to 0.02 (2 percent per year) that was obtained for the 98 countries by allowing for differences in the steady states of the countries. The different steady states of countries indicate the presence of conditional convergence.[67]

4.1. Types of Convergence

After a general introduction to convergence issue, types of convergence would be explained. Two methods are frequently used in the convergence hypothesis. Negative significant relation between growth and initial income indicates β convergence. As Quah (1996) mentions, σ-convergence examines the decrease in per capita income between the related units is analyzed. This section includes β, σ, Absolute, Conditional Convergence and Distribution Dynamics. These are the most known convergence types examined empirically in the studies.

4.1.1. β Convergence

β convergence in the literature is the basic base-effect driven approach. It tests the regional differences in growth rate depend on the initial income level of the regions.

[65] Robert J. Barro, "Economic growth in a cross-section of countries". *Quarterly Journal of Economics*. 106(1991): 407-443.
[66] Robert J. Barro, and Xaxier Sala-i Martin, "Convergence across States and Regions" Brookings Papers on Economic Activity, 1(1991):148.
[67] Barro, R. J. and X. Sala-i Martin, "Convergence." *The Journal of Political Economy*, 100. 2(1992): 223- 251.

The general agreement in the literature is that such an association exists strongly and that the regions with relatively low initial per capita income are growing faster than those with high initial per capita income. In other words, poorer regions are growing faster than relatively richer regions.

The regional growth rate depends on initial per capita income. This proposition is tested by regression analysis. The model of Barro ve Sala-i Martin (1992) is as follows:

$$\frac{1}{T}\ log\left(\frac{y_{i,t}}{y_{i,t-T}}\right) = \alpha - \left[\frac{1-e^{-\beta T}}{T}\right].log\left(y_{i,t-T}\right) + u_{i,t} \quad (4.1)$$

For the determination of β convergence, the coefficient of the initial income β_1 shold be greater than zero and statistically significant in the 95 per cent confidence interval. When evaluating the output of the analysis, it is also desirable that the value of R^2, which is the explanatory power of model for dependent variable, is high (more than 80% is preferred).

In addition, for the β coefficient in the model, the variance of the error term should not be variable (no heteroscedasticity). In the β convergence analysis, the p-value calculated for the β_1 coefficient is determinant. It is because of null hypothesis:

H_0: $\beta_1 = 0$ (growth rate is not related to initial income level)

This hypothesis is accepted when the calculated p-value is greater than 0.05 for the 95% confidence level. As the p-value approaches zero, the relationship between these two variables is assumed to be stronger.

Quah (1996) emphasized that convergence regards that the cross-sectional distribution of income and growth rate disperse. A negative β value from the growth-initial level regression does not imply reduction in this dispersion.[68]

According to this perspective, convergence is the examination of the dispersion dynamics of income levels (growth rates). At this point, σ-convergence is another means to show the distribution of income levels.

[68] Danny T. Quah, "Regional convergence clusters across Europe".*European Economic Review*, 40 (1996): 951-958.

4.1.2. σ Convergence

Together with β convergence, σ convergence is another analysis to examine the income distribution. σ is the notation for standard deviation of the cross-sectional distribution of income levels. Unlike β, σ convergence does not try to explain the convergence with any parameter. It aims to find out the presence of convergence in income distribution. If the variance of initial regional income is greater than the variance of regional income at the end of the period; in other words if the variance between the start and end of the period is decreasing, it is said the regional income distribution gets better. If the regional income is larger than the variance, the variance between the income levels during the period decreases; with another expression, results in the improvement of regional income distribution.

The analysis has been mostly used with β analysis. In the case of convergence in regional income distribution, a graph of negative slope variance coefficient with respect to time should be observed.

4.1.3 Absolute Convergence

The basic neoclassical model has two main anticipations. According to the first anticipation, it is assumed that each economy will converge towards its long-term equilibrium position. The second one assumes that all the economies will converge towards a common long-term equilibrium position.

If growth parameters are same across countries, NCGT predicts absolute convergence. The model allows for open regional economy with net labor and capital inflows that are exogenous. Based on the equation of Solow model, absolute (unconditional) convergence implies that all elements are same for the economies considered.

Approaching to the common steady state demonstrates the absolute convergence. However, diminishing the income (productivity) differences among countries is not a general case, and a new concept has been introduced to the basic neoclassical model: conditional convergence.

4.1.4. Conditional Convergence

In the case of conditional convergence, equilibrium points (steady states) differ in economies. Each particular economy reaches to its own and unique equilibrium. Contrary to that, the idea of club convergence depends on models that yield multiple equilibrium levels.

Barro originates the empirical findings based on conditionally convergence. Islam (2003) examines Barro's model and other empirical studies and notes the empirical difficulty in distinguishing club convergence from conditional convergence. He explains the relation of conditional convergence and club convergence.[69] One characteristics of NCGT is the uniqueness of the equilibrium point assumed by usual convergence. In the case of unconditional (absolute) convergence, there is one steady state in all economies.

The neoclassical growth model leads to conditionally convergence. However rejection of the absolute convergence hypothesis does not mean the natural rejection of the neoclassical growth model. Barro and Sala-i-Martin (1992) and Mankiw et al (1992) fulfilled the conditional convergence. In the The former used Cass-Koopmans optimal savings version of the neoclasical growth model while the latter used Solow-Swan model.

4.1.5. Distribution Dynamics

Too much emphasize on σ-convergence causes to miss the principal important features of economic growth and convergence. The distribution dynamics approach emphasizes on σ-convergence that is related with changes in the cross-section income distribution. It has actually proceeded along two lines. Distribution dynamics maintains a relationship with β convergence. It tries to work out the precise relationship between β and σ.

Distribution dynamics indicates the limits of β convergence focusing on the entire distribution.[70] Quah (1996) reported new findings about persistence and

[69] Nazul, Islam, "What have we learnt from the convergence debate?" *Journal of Economic Surveys*, 17.3 (2003): 309- 362.
[70] Danny T. Quah, "Twin Peaks: Growth and Convergence in Models of Distribution Dynamics". *The Economic Journal*, 106, 437(1996): 1045-1055

stratification, formation of convergence clubs, the distribution polarising into twin peaks of rich and poor. He ensured those factors that are important for growth, and opened up a discussion without boosting the inputs in a neoclassical production function favoured by the traditional approach.[71]

For a general evaluation of convergence definitions and their implications, its historical evolution starts with the notion of absolute convergence flowed by conditional convergence. Both of them are studied using β convergence. The notion of σ-convergence arises thereafter. The informal cross-section holds with formal cross-section followed by panel approach. Further, it is developed through time-series and the distribution approaches.

In pursuit of a brief theoretical explanation of convergence debate, the empirical dimension of convergence studies are revealed. Related researches could be conducted along four different approaches, namely the cross-section, panel, time-series, and distribution approaches.[72] These methodological approaches could be associated with various convergence definitions and different results.

Studies on within country and interregional income inequalities are based on endogeneous growth theory, out of which come to the fore. Barro and Sala-i Martin (1992) for U.S. metropolitan cities, Neven (1995) for European regions, Jian et al (1996) for Chinese regions, and Azzoni (2001) for Brazilian regions.

The prominent approach in these analyses is testing β convergence first. It helps to detect the base effect. According to this approach, the regions with lower initial income levels will grow more than those regions with higher initial incomes. In many studies, this thesis has been tested and accepted. The power of relation depends on the structural differences of the economies of regions.

Barro (1996) tried to determine the factors affected by multiple regression analyses and achieved consistent results. It is revealed that the most effective factors are the human capital and the mobility of labor and capital. The mainstream fieldwork Barro and Sala-i-Martin (1992), Sachs et al (2002), Sala-i-Martin (1996) needs a different approach from the methods used in those studies. From that point, β convergence relatively has lost its significance, and the method of σ-convergence is added to the methods used for convergence analyses. σ convergence, unlike β

[71] Ibid: 1052.
[72] Nazul, Islam, "What have we learnt from the convergence debate?" *Journal of Economic Surveys*, 17.3 (2003): 309- 362.

convergence, is simply an approach that estimates the distribution of regional income based on the standard deviation or variance coefficient. It is accepted that the σ convergence analysis gives stronger results than the β convergence analysis because it is free from assumptions and adopts a basic method.

4.2. International Convergence Studies

Ray (2007) states that Solow's (1956) pathbreaking work introduces the notion of convergence. Countries with a low endowment of capital relative to labor will have a high rate of return to capital, by the law of diminishing returns.

A great number of empirical studies on the regional convergence studies compose the literature. Preemptively, earlier studies concentrated on 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.[73]

Recently, studies encompass various spatial levels dealing with 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.

The studies of Baumol (1986), Barro and Sala-i Martin (1991), Mankiw et al (1992) introduced the convergence in per capita income across or within the countries. Thereafter, a large number of studies tried to understand whether there exists convergence among or within countries. Two main concepts of convergence, β convergence (unconditional or conditional) and σ-convergence have been used in the literature. Baumol (1986) tested the neoclassical prediction of convergence and found a negative β coefficient. The low-level per capita economies have higher growths, as cited in Neoclassical Growth Theory. Barro and Sala-i-Martin (1992) studied convergence across US states using the Cass-Koopmans version of the NCGT and found substantial evidence of convergence. Rate of convergence is estimated as two percent per year.

On the contrary, Holtz-Eakin (1993) emphasized the differences in steady states among the US states. They revealed conditionally convergence.

[73] S.,Magrini, "Regional (di) convergence". *Handbook of regional and urban economics*, 4 (2004): 2741-2796.

In terms of regional convergence, Sala-i-Martin (1996) presented a comprehensive study examining convergence across regions of Japan, Germany, the UK, France, Italy, Spain, and Canada. He assumed a position of unconditionally convergence. Similar to US, convergence rates were determined as approximately two percent annually.

Caselli et al (1996) examined 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 per cent per year. Additionally, they criticized the existing consensus of 2 per cent growth per year for being unrealistic.[74]

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 converge conditionally.

Pritchett (1997) studied the growth pattern of developed and developing countries The study suggests the existence of a divergence pattern among the two sets of countries. The developed countries converge to themselves and grow faster than the developing countries, and the gap increases.[75]

David (2005) revealed the existence of the club convergence pattern. The study suggests that income gaps have increased within most of countries. Furthermore, the highest convergence clubs arise among the world's very poorest countries.[76]

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.
Neoclassical growth theory assumes the existence of the convergence pattern across the similar countries that is in an accordance with the study.[77] de la Fuente (2000) criticizes the neoclassical growth models and dissatisfies regarding the existing consensus on the determinants of the growth. The critique is that the neoclassical models are unable to account the key features and the lack of capital flows. In his study, he reports evidence

[74] Caselli, F., Esquivel , G., and F. Lefort, "Reopening the Convergence Debate: A New Look at CrossCountry Growth Empirics." *Journal of Economic Growth*, 1.3(1996): 363–89.
[75]L. Pritchett, "Divergence, big time". *The Journal of Economic Perspectives*,(1997):3-17.
[76]H. L. David, "So Many Measures of Trade Openness and Policy: Do Any Explain Economic Growth?" UMI No. 3179497.(2005)
[77]E. Kočenda, "Macroeconomic convergence in transition countries".*Journal of Comparative Economics*, 29.1(2001):1-23.

of the long-run convergence tendencies both across the countries and across the regions.[78]

The study of Garofalo and Yamarik (2002) verifies the results of the study of Barro and Sala-i-Martin and indicates a convergence rate about 2% across the countries.[79] Petrakos et al (2005) test the two hypotheses of Solow's neoclassical 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.[80] Mazumdar (2002) uses the convergence test introduced by Baumol (1990) and added the standards of living using a human development index into the measurement, which yields better outputs than human well-being.

The tendency of regional level analyses in the convergence literature does not date back to old times. 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.[81]

Lall and Yılmaz (2001) examine the relationship between the public capital, regional output and private sector productivity and the convergence among U.S. regions between 1960 and 1990. The study shows that the speed of convergence is influenced by region specific characteristics and the availability of high skilled labor in neighbor regions.[82] Carvalho and Harvey (2002) examine 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.[83]

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

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[78] A. De la Fuente, "Convergence Across Countries and Regions: Theory and Empirics". *CEPR Discussion Paper* No. 2465, London: CEPR. Debate: "A New Look at Cross-country Growth Empirics". Journal of Economic Growth, 1.3(2000): 363-389.

[79] G. A.Garofalo and S. Yamarik, "Regional convergence: Evidence from a new state-by-state capital stock series". *Review of Economics and Statistics*,84.2(2002):316-323.

[80] Petrakos, G., Rodríguez-Pose, A., & Rovolis, A., "Growth, integration, and regional disparities in the European Union. Environment and Planning A,37.10(2005): 18-37.

[81] M. Terrasi, "Convergence and Divergence Across Italian Regions". *Annals of Regional Science*, 33(1999): 491-510.

[82] Lall, S., & Yilmaz, S., "Regional Economic Convergence: Do Policy Instruments Make a Difference?". .*Annals of Regional Science*, 35.1(2001): 151-166.

[83] V. M. Carvalho and A. C.Harvey, "Growth, cycles and convergence in US regional time series". *DAE Working Paper* 0221(2002),University of Cambridge

estimates 7 percent convergence speed across regions by using a spatial dynamic panel analysis.[84]

The study of Ertur et al (2006) examines 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 differs in 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.[85]

Dall'Erba and 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. In addition to this, the study reveals that simulation experiments show the investments targeted to the peripheral regions never spill over to their neighbors regions.[86]

Artelaris et al (2010) examine 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.[87] Similar to the study of Artelaris et al (2010), Bartkowska and Rield (2012) aim to investigate the convergence clubs in per capita incomes across the 206 European NUTS II regions between 1990 and 2002.

They examine 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. Beside this, 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.[88]

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[84] Badinger, H., Müller, W., & Tondl, G., (2002), "Regional Convergence in the European Union (1985-1999): A Spatial Dynamic Panel Analysis". IEF Working Paper No. 47, Vienna University of Economics.
[85] Ertur, C., Le Gallo, J., & Baumont, C., "The european regional convergence process, 1980-1995: Do spatial regimes and spatial dependence matter?". *International Regional Science Review*, 29.1(2006):3-34.
[86] Dall'Erba, S., & Le Gallo, J., "Regional convergence and the impact of European structural funds over 1989–1999: A spatial econometric analysis" *Papers in Regional Science*, 87.2(2008): 219-244.
[87] Artelaris, P., Kallioras, D., & Petrakos, G. "Regional inequalities and convergence clubs in the European Union new member-states" Eastern Journal of European Studies, 1.1(2010): 113-132.
[88] M. Bartkowska and A. Riedl, "Regional convergence clubs in Europe: Identification and conditioning factors". *Economic Modelling*, 29.1(2012): 22-31.

Evans and Kim (2014) investigate the effects of technological spillover and spatial interdependence on regional inequality across the 13 regions between 1985 and find significant convergence. 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.[89]

4.3. Empirical Convergence Studies in Turkey

In literature, convergence analysis is done not only for income convergence but also for very different macroeconomic variables. However, a great part of the studies has focused on the income convergence in Turkey (Filiztekin, 1998; Doğruel and Doğruel, 2003; Karaca, 2004; Gezici and Hewings, 2004; Yeşilyurt, 2011). Convergence studies have analyzed the more national income in Turkey. These studies show that there is no consensus at the regional level in terms of convergence results (Filiztekin, 1998; Berber et al 2000; Erk et al, 2000; Doğruel and Doğruel 2003; Karaca 2004; Gezici and Hewings 2004; Erlat 2005; Aldan and Gaygısız 2006; Kılıçaslan and Özatağan, 2007). Apart from that, there are some other analyses of convergence made for public expenditures (Sağbaş, 2002; Önder et al, 2007) and sectoral efficiency level (Kök and Yeşilyurt, 2006).

The outstanding empirical studies on convergence in Turkey are studies of Filiztekin (1998), Gezici (2004), Karaca (2004) and Yıldırım et al (2009). These empirical studies have showed evidences of both regional convergence and divergence patterns of per capita income. Filiztekin (1999) studied convergence on the "annual provincial gross domestic product per adult population" between the years 1975 and 1995. He put the indicator as "the share of agricultural output in the initial year" to control for sectoral composition.

According to his findings, the dominant sector is still low productive agriculture. There is a labor mobility flowing from agriculture to other sectors, especially in services. He emphasizes to the point that 75% of aggregate productivity depends on the sectoral shift from agriculture to other sectors (Filiztekin, 1999). Based on this study, rich provinces are converging towards each other, while the poor provinces become

[89] Evans, P., & Kim, J.U., (2014). The spatial dynamics of growth and convergence in Korean regional incomes. Applied Economics Letters, (ahead-of-print), 1-5.

more dispersed. The descriptive analysis predicts a bimodal distribution for Turkish provinces. There are two convergence clubs in Turkey.[90]

Temel et al (1999) in their study between 1975 and 1990 found that labor mobility causes decline in dispersion. It is increased due to the sector productivity resulted in agglomeration of highly productive sectors in certain provinces. Istanbul-Izmit corridor, Izmir and Adana are outstanding provinces with high productivity levels.[91]

Between the years of 1975 and 1997, Berber et al. (2000) find divergence pattern among Turkish regions. According to Atalık (2002) between 1975-1985, the income inequality increases because of functional regions, evidence of divergence.[92]

Şenesen (2002) reveals a polarization process between west-coastal and east-inner parts of Turkey.[93] Moreover, studies of Öztürk (2003; 2005) focus between the years 1965 and 2001. He expresses a significant increase in regional income inequalities, an implication for divergence. However; the increasing trend decreases in the last decade of the period.[94]

Karaca (2004) used GDP per capita between the years of 1975-2000 in 67 provinces, using west-east dummy variable. To reflect the structural characteristics of regions, the share of added value of agricultural sector is used. He discovers an increase in income inequality to the detriment of eastern part of Turkey. He finds no evidence of convergence. He puts forth the deep income inequality is due to the labor mobility from east to the west.

In the study period of 1980-1997, Gezici and Hewings (2007) find that intra-regional inequalities decrease in all regions as inter-regional income inequalities increase.

Another empirical result for convergence is introduced by Doğruel and Doğruel (2007). They find that between the years of 1987-1999 there is evidence for

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[90] Alpay Filiztekin, "Convergence across Turkish Provinces and Sectoral Dynamics".(1999) Koç University.

[91] Temel T., Tansel A., & Albersen P.J., "Convergence and Spatial Patterns in Labor Productivity: Nonparametric Estimations For Turkey". *Journal of Regional Analysis and Policy*, 29.1(1999): 3-19.

[92] Atalık, G. "Some Effects of Regional Differantiation on Integration in the European Community, Regional Development Reconsidered", Ed. by, G. Atalık ve M. Fischer, Springer: 187-196.

[93] Şenesen, Ü. Türkiye'de Bölgesel Gelir Dağılımında Son Gelişmeler, 10. Ulusal Bölge Bilimi/Bölge Planlama Kongresi, (2002) İstanbul.

[94] L. Öztürk, "Bölgelerarası Gelir Eşitsizliği: Coğrafi Bölgeler Üzerine Tanımlayıcı Bir Analiz 1965 2001", Uludağ Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 22.2(2003): 13-33 and
L. Öztürk, "Bölgelerarası Gelir Eşitsizliği: İstatistiki Bölge Birimleri Sınıflandırması'na (İBSS) Göre Eşitsizlik İndeksleri İle Bir Analiz, 1965-2001", Akdeniz İ.İ.B.F. Dergisi, 10(2005): 95-110.

convergence in per capita income only in developed regions.[95] Moreover, Baypınar and Erkut (2011) find that poorer regions grow faster with a convergence at about 1.89% per year. The emphasis of the study is about productivity, and the result indicates that the inequalities between productive and less productive regions are decreasing in a slow rate. Initial productivity levels of neighbor regions have a positive impact on growth of productivity in a region, that is to say the emergence of spillover effect.

Kılıçaslan and Özatağan (2007) test convergence across provinces between the years 1987-2000. They use relative population change which is 30% larger than that of income. Karaalp and Erdal (2009) explain intra-regional convergence except Aegean region, and interregional divergence.[96] Between 1991-2000, Zeren and Yılancı (2011) find absolute convergence in 17 regions, and conditional convergence in 25 regions.[97]

Yıldırım et al (2009) find evidence of traditional east-west income differences and clusters in four large regions. They also reveal that there appears a considerable variation per capita income across provinces. β convergence is supported that poorer provinces i.e. eastern and southeastern provinces will have higher speed of convergence. Furthermore, they examine endogenous factors such as fertility rate and average unemployment rate, and find that the higher rates of both factors hinder the economic growth. Additionally, higher education level enhances spatial variability among provinces. As a last contribution, they remark that the positive effect of real per capita government expenditures is more prominent in the more developed western areas.Önder et al (2010) estimate the effects of public capital stock on regional convergence using conditional convergence model based on initiak oer capita real income and public capital stocks at NUTS II regions in Turkey. The results show that Sigma and conditional convergence exist for the period of 1980-2001. Per capita public capital stock has a positive effect on per capita income at NUTS II regions. [98]

Furthermore, Baypınar and Erkut (2011) present that human capital (extension in per worker scientific and technological progress) is the effective input for productivity growth. They conclude that there is evidence of conditional convergence,

[95] Doğruel, F., and A.S. Doğruel, "Türkiye'de Bölgesel Gelir Farklılıkları ve Büyüme" Köse, AH, Şenses, F ve Yeldan, E.(der.) İktisat Üzerine Yazılar I: Küresel Düzen, Birikim, Devlet ve Sınıflar, Korkut Boratav'a Armağan içinde, (2003): 287-318.
[96] Karaalp, H. S. ve Erdal, F. "Türkiye'de İller ve Bölgeler Arasında Gelir Farklılıkları: Sigma Yakınsama Analizi", I. Uluslar arası Davraz Kongresi , (2009): 27 39.
[97] Fatma Zeren, Veli Yılancı, "Türkiye'de Bölgeler Arası Gelir Yakınsaması: Rassal Katsayılı Panel Veri Analizi Uygulaması" İşletme ve Ekonomi Araştırmaları Dergisi, 2.1(2011):143- 151.
[98] Özlem Önder, Ertuğrul Deliktaş and Metin Karadağ, "The Impact of Public Capital Stock on Regional Convergence in Turkey". European Planning Studies. 18.(2010):1041-1055.

but they point out that regional growth is stronger in regions around developed metropolitan regions. Regional inequalities are still persistent between east and west.

The empirical migration and regional convergence are summarized in the next section with exemplifications of international and Turkish studies.

4.4. Empirical Convergence Studies with regards to Migration in Turkey

Firstly, empirical studies about Turkey have been revealed in order to deepen the perception of the relation between growth and migration patterns. This part consists of a brief of the studies by Yamak and Yamak (1999), Kırdar and Saracoğlu (2006; 2008, 2012) and Kılıçaslan and Özatağan (2007), Drinkwater et al. (2003).

The standard growth model anticipates that labor mobility across regions enables to increase the speed of convergence in per capita income levels. On the contrary, migration has adverse impacts on regional growth rates. As the issue of labor mobility has been uncovered empirically, the migration debate has not been uncovered yet.

Yamak and Yamak (1999) studied income distribution and the phenomenon of internal migration in Turkey. In this study, the relationship from 1980 to 1990 the net migration rate of 67 provinces with per capita income figures in Turkey were statistically analyzed. The study addresses two basic questions: First; how much of the population has migrated for economic reasons, and the second is the degree of internal migration if the imbalances in income distribution are eliminated.

In the empirical part of the study, it is understood that the regional imbalance of income plays an important role on internal migration. This role is due to the high income levels of the net immigrants receiving rather than net migration from the low income level. Another finding is that if the average net emigration of convergence of the average per capita income of Turkey, these cities will show a 25% reduction of net migration rates. It is understood that about 25 out of every 100 people who migrate from the outmigration cities to other cities emigrate for economic reasons.[99]

Following, Kırdar and Saracoğlu (2008) investigate absolute and conditional convergence in per capita income across Turkish provinces between the years 1975 and

[99] Nebiye Yamak and Rahmi Yamak, "Türkiye'de Gelir Dağılımı ve İç Göç" Dokuz Eylül Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 1.1(1999): 16-28.

2000. It is resulted in empirical evidence of the unfavorable causal impact on growth rates.[100]

They include 67 provinces in the study and use real per capita gross provincial products, net inter-provincial migration rates, provincial population densities (population per km^2), and the state of emergency status of provinces. They use instrumental variables estimation method with an instrument unique to Turkey in order to control provincial fixed effects.

They find absolute divergence in Turkish provinces with annual rate of 0.48% between 1975 and 2000. They find evidence for convergence by increasing the number of regional fixed effects. The impact of migration on the speed of convergence and on the regional growth rates are examined.

However incorporating migration as a regressor into the growth equation is critical because of its endogeneity. In order to preclude, Two Stage Least Square (2SLS) estimation is performed. They reveal significantly adverse effects of migration on regional growth rates. Inter provincial migration speeds up convergence in Turkish provinces.

In another study, Kırdar and Saracoğlu (2012) aim to investigate convergence in income levels. They find that there is no evidence for convergence in terms of interprovincial migration because there is still an endogeneity bias between internal migration and growth rates. They find absolute divergence with a speed of 0.7%.[101]

In order to control the structural characteristics, they use regional dummy variables, and the shares of agriculture, industry, and service sectors in provincial added value. If separating regional and sectoral differences, there is evidence for conditional convergence in per capita income. Keeping the speed of technological changes for all regions as constant, in western and eastern Marmara converge to a higher per capita income level comparing to others.

They especially pay attention to the result that in out-migration provinces, the fall in the labor intensity leads to the decrease in the marginal return on capital that hinders the flow of productive investments. Due to the discouragement for investment, out migration provinces are disabled the speed of or realization of convergence.

[100] Kırdar, M. G. and D. Ş. Saracoğlu, "Migration and regional convergence: An empirical investigation for Turkey." Papers in Regional Science, 87 no. 4 (2008): 545- 566.
[101] Kırdar, M. G. and D. Ş. Saracoğlu, "İç Göç, Bölgesel Yakınsama Sorunu ve Ekonomik Büyüme: Türkiye Örneği." Türkiye Ekonomi Kurumu, Tartışma Metni, 2012/ 75.

Furthermore, Kılıçaslan and Özatağan (2007) aim to demonstrate the impact of relative population change on regional income convergence. They use 64 provinces of Turkey between 1987-2000. The result implies that both income and per capita income between provinces indicate converging patterns.[102]

They examine the difference between the convergence rates of income and per capita income by incorporating the relative population change with a decomposition analysis. They conclude that the 17 percent share in growth per capita income is due to the change in population in favor of high per capita income-provinces.

From an international perspective, Drinkwater et al. (2003) review theoretical and empirical papers by examining economic effects of labor mobility with a particular reference to intra-European migration.[103]

They investigate three issues indeed: 1) Do immigrants have a role to play in raising skill levels? 2) Does migration with a particular skill composition lead to long-term growth of host country? 3) Does the immigration have an economic effect? Based on the general impression, migration increases growth in terms of endogenous and short-run growth, particularly in the case of highly skilled workers inflow.

Especially depending on high-skilled migration, migration from Eastern to Western Europe may have positive effects on growth in terms of enlargement of the EU. The process of convergence is expedited by movements of people out of areas where ratios of capital to workers are low and hence wage rates and levels of per capita income are also low to areas where they are high.

The supposition behind the net migration flows in the convergence is the identical opportunities and government policies in each U.S. states which are differed by initial ratios of physical capital to labor, and hence by wage rates, and that existing capital cannot move. Then, people are motivated to move from low-wage to high-wage areas. According to the model, assuming costless moving (entails costs in reality), the migration of persons would equalize per capita incomes spontaneously. The assumption of identical persons (workers) does not neglect the heterogeneity among persons; on the contrary, it is for avoiding matching problem of wage rates and employment. Beside the characteristics of individuals, the features of areas also are influential factors. Areas

[102] Kılıçaslan, Y. and G., Özatağan, "Impact of Relative Population Change on Regional Income Convergence: Evidence From Turkey," *Review of Urban & Regional Development Studies*, 19 no. 3 (2007): 210- 223.

[103] Drinkwater, S., P., Levine , E., Lotti and J., Pearlman, "The economic impact of migration: A survey". *School of Economics Discussion Papers* (2003).

differ in utility or production conditions, climate, natural resources and government policies.

Barro and Sala-i-Martin (1991) also examined the migration of persons among the U.S. states in the context of the process of growth and convergence. They noted that a greater degree of labor mobility leads theoretically to a higher convergence coefficient. This means that the rates of Beta convergence would be higher for the regions within countries than for across countries. Direct estimates for the effect of net migration across the U.S. states indicate, however, that this effect is small.[104]

4.5. Migration Theories

The migration phenomenon, both in terms of its types, causes and consequences, having a multi-dimensional nature according to the region/country, it is not possible to explain the phenomenon with a single theory. Therefore, in order to analyze any migration movement accurately, it is useful to look at the various theories about the migration in the first place. Finally, it should be emphasized that although there are various migration theories, it is also necessary to evoke that these theories are developed with specific conditions of specific countries or regions.

To speak of migration theories, it is also important how the economic theories approach to labor migration. According to the Neoclassical Theory, there are three models generated to explain the labor movements, that are, Dual Sector Development Model (dualist model), Micro Economic Theory and Macro Economic Theory.

Lewis (1954) developed the first model, dual sector development model (dualist). He conducted the study on labour migration that carried out the first work in this field among development models. This model suggests that labour migration plays a key role in the process of economic development.

Lewis (1954) attributes the development and industrialisation of developing countries to the transfer of the "Unlimited Supplies of Labour" in agriculture to the industry, and their employment in the industry. This model argues that the transfer of hidden labour in agriculture or excessive labour force to the industry would be enabled

[104] Barro, R. J. and X. Sala-i Martin. "Convergence across States and Regions" Brookings Papers on Economic Activity, 1(1991):107-182.

through differences between the subsistence wages earned in rural areas and the wages in urban areas. He argued that this should be done forcibly by the state.[105]

Secondly, Todaro and Borjas developed micro economic theory in the 1960s and 1970s.[106] The theory analyses the reasons why people react to interregional differences by migrating. Thus, migration comes out because of the rational decisions made by the individuals who wish to raise their standard of living by moving to areas that offer high wages.[107]

Todaro (1976) stated that the decision to migrate arised because of the rational and economic assessment of the financial and psychological benefits and costs.[108] Abadan-Unat (2006) speaks of that the decision of migration should be regarded as an investment in human capital.[109]

Following the comparative analysis of the benefits and costs of migration, the decision to migrate has been made individually. At this point, the difference is the fact that not only the issues regarding wages are assessed, but also the conditions and other cultural relations in the area to be immigrated are taken into consideration.[110]

Todaro (1969) underlines a vicious circle related to migration from rural to urban areas. [111] The more job opportunities there are, the more people will be attracted to migrate to the area, which would result in a higher rate of unemployment. This circle is called the "Todaro Paradox".

Lastly, the Neoclassical Macro Economic Theory explains the development of labour immigration within the process of economic development. According to this theory, supply and demand disparities in the labor market are the driving force behind immigration. It asserts that labour emigrates from low-wage countries to high-wage ones. Just as the disparities among wages could increase the rate of immigration, a decline in these disparities could reduce the rate of immigration.

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[105] Lewis, W. A., "Economic Development with Unlimited Supplies of Labour". The Manchester School, 22(1954): 139-191

[106] M. P. Todaro, "*Internal Migration in Developing Countries: A review of theory, evidence, methodology and research priorities"*, International Labour Organization, Geneva(1976).

[107]G. Toksöz, "Uluslar Arası Emek Göçü". İstanbul Bilgi Üniversitesi Yayınları: İstanbul.(2006).

[108]S. Kaygalak, "Yeni Kentsel Yoksulluk, Göç ve Yoksulluğun Mekansal Yoğunlaşması: Mersin/Demirtaş Mahallesi Örneği".Praksis, 2(2001).

[109] N. Abadan-Unat, "Bitmeyen Göç". İstanbul: İstanbul Bilgi Üniversitesi Yayınları. (2006).

[110] J. J. Schoorl et al, "Push and Pull Factors of International Migration: A Comparative Report", The Hague. Luxembourg, Eurostat, Theme 1 General Statistics. (2000).

[111] Todaro, Michael P. "A Model of Labor Migration and Urban Unemployment in Less Developed Countries." The American Economic Review, 59.1 (1969): 138-48.

At macro level, immigration results from the unequal geographical distribution of capital and labour. This situation shows itself in the inequalities between wages and living conditions, and immigration occurs due to the push of supply and the pull of demand. Here, the shift of labor force emerges from the agricultural sector in rural areas with a manpower surplus, to the industrial sector in urban areas. In this model, this shift is considered positive and the surplus of labor is benefited in the urban industrial sector, which rapidly develops due to its capital stock and technological development.

4.6. Migration History in Turkey

Özbay and Yücel (2001) mainly discuss the role of internal migration at the national level. [112] They examine the migration flows in Turkey under favor of data gathered from the Population and Health Research held in 1998 and aim to suggest policies about migration. They focus on woman migration patterns with the examination of socio-cultural dimensions of migration and the relation of migration and demographic structure. Özbay and Yücel (2001) distinguish migration history into three parts. The first period corresponds to the forced migration epoch comprehending 1923-1950 period. The second period indicates 1950-1980 period associated with labor migration. They acknowledge the period after 1980s as the recent period.

From the 1850s until the establishment of the Republic, Anatolia witnessed immensely important and tortuous immigration adventures(Özbay and Yücel,2001:33). In company with the proclamation of Turkish Republic, two general drivers initiated migration in its earlier period. In order to complete the lack of agricultural labor, state had land and monetary assistance. Furthermore, state had policies to settle down the emigrants and prevent insurrections.[113]

In this early period of internal migration in Turkey, state had some other policies to control the migration flows. With the Economic Program enacted in 1930, by obtaining land and residence landless peasants are transformed into landowners while nomadic peasants into permanent producers. In the earlier years of Republic, there are migration flows from İstanbul to the capital Ankara. The population growth in Ankara begins with the middle-income class, educated migration; that is selective, to the city.

[112] Ferhunde Özbay and Banu Yücel, "Türkiye'de Göç Hareketleri, Devlet Politikalari ve Demografik Yapı". Nüfus ve Kalkınma, Hacettepe Nüfus Etütleri Enstitüsü. Ankara (2001): 1-51.
[113] Ferhunde Özbay and Banu Yücel, "Türkiye'de Göç Hareketleri, Devlet Politikalari ve Demografik Yapı". Nüfus ve Kalkınma, Hacettepe Nüfus Etütleri Enstitüsü. Ankara (2001): 6.

These emigrants introduce the modernization movement in cities which though country organizations into Anatolian cities. The first republican governments have allowed a limited number of immigrants to come to the city for education in order to hold the agricultural labor force, which is the basis of economy, in countryside.[114]

The following period comprising the thirty years between 1950 and 1980 is regarded as the first labor migration wave appeared in the form of rural-to-urban mass migration associated with the modernization policies in agriculture. Tümertekin (1970) investigated the internal migration from a demographic perspective, especially the first great migration movements faced in Ankara, İstanbul and İzmir. Migrants leaving the rural areas are moving directly to large cities instead of gradual migration firstly to towns; then to cities and great cities. As Kıray (1982) figured in the metropolitanization process in the developing countries, the rural population accumulated in the expanding single dominant city because of the unstable growing of settlement units.[115]

Associated with planned period started in 1960s, the number of studies about migration and gecekondu increased. Demographers had measured the internal migration rates and direction of migration as well as determining of migrants' characteristics based on census data, while the economists tested the first economic models aiming to explain internal migration.

Migration movements after 1950s could be examined by distinguishing into two major periods; the first period comprises the process started with modernization in agriculture until the industrial development. The beginning of second period indicates the year 1970 because the studies showing the changing characteristics of migration were based on the data of 1970 Population Census.

From early 1950s to 1970s, the first period is described as modernization in agriculture and proliferation of rural to urban migration. Population coming out due to agricultural modernization migrated to work in nonagricultural sectors in urban areas. Tekeli (1977) stated that the driving force of rural areas has been mentioned instead of attraction of urban areas. Due to the leaving of ten people unemployed by each tractor in the countryside, the increasing migrant army flocked to larger cities with higher employment opportunities.

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[114] Ibid: 6-9.

[115] Mübeccel Kıray, "Modern Şehirlerin Gelişmesi ve Türkiye'ye Has Bazı Eğilimler" Toplumbilim Yazıları. Ankara: Gazi Üniversitesi. (1982)

Contrary to Lewis migration model assuming rational men who migrate to increase their incomes, Todaro (1969) developed the neoclassical migration theory and asserted the income expectancy was more important than the income itself.[116] The new migration models developed from the neoclassical core revealed the migration process as a household life strategy.[117] As Massey (1988) detected, it is necessary for the undeveloped region to exceed the threshold of critical development in order to start mass migration between developed and underdeveloped regions.[118]

Kıray (1982) explained the rural to urban migration patterns earlier than the international migration studies.[119] The rural to urban migration mechanism has been explanatory usually for migration experiences in Turkey. The mechanism works in this way: the migrant-generally the younger men in the family has been chosen to migrate-has been supported by the rural family for a time, after getting a job and conformance to the city the migrant has supported financially the rural population. Indirectly, it is executed that the first comers are not the poorest in the countryside, and the decision maker turns into household rather than the individual.

When addressing the political dimension of migration, Democratic Party carried out an economic policy devoted to agricultural modernization, did not attempt to hold the population in rural areas. Immigrant men in urban areas constituted the reserve labor army who contributed the industrial development by hindering the increase of wages. On the other side, landowners having higher earnings migrated to cities in order to invest in industry based works.

The second period is defined with industrialization, urban-to urban migration and emigration. The governments after 1960 approved urbanization and population movements to cities by force of import-substitution industrialization policies.

In the first five-year development plan, the State Planning Organization established in 1961 indicated a balanced urbanization system by generating new work areas in countryside or driving the rural population to new developing urban centers with the justification of no contribution of rural population to agricultural production

[116] M., Todaro, " A Model of Labor Migration and Urban Unemployment in Less Developed Countries" *American Economic Review*, 59(1969):131-148.
[117] Douglas S. Massey, "Economic Development and International Migration". *Population and Development Review*. 14.3(1988): 383-413.
[118] Ibid: 397.
[119] Mübeccel Kıray, "Modern Şehirlerin Gelişmesi ve Türkiye'ye Has Bazı Eğilimler" *Toplumbilim Yazıları*. Ankara: Gazi Üniversitesi (1982)

and aim of stopping migration to particular cities. In the second five-year development plan, big cities were encouraged to grow.

Furthermore, some precautions for fundamental problems of urbanization were taken such as minimizing regional inequalities, accepting eastern cities as priority regions for development, decreasing the number of villages by uniting them in order to provide efficient services; however they were not transformed into effective programs.

In this period, the policy of decreasing the population growth in rural areas was adopted. Meanwhile, the agreement between Turkish and German governments cleared the way for labor migration to Germany, which encountered the new agenda of Turkish development policies.

By favor of state, the majority of the first immigrants were from rural areas. This move of state was a political attempt but not an efficient policy to regulate rural-to-urban migration. Between 1965 and 1970, Tanfer (1983) investigated the migration patterns, monitored the increase of urban-to-urban migration.[120]Another fact observed in the same period was the increase in women migration. Yener (1977) considered that this Rise might be related to family migration.[121] This type of migration has been a significant change compared to earlier periods. In the wake of the twenty-year period, 1970 Population Census indicates a shift in migration studies because of the direct estimation of the migration in thelast five years, with an additional question into the census.

Post-1980 period has been identified with local and global changes. The indirect effect of state policies could not be denied in the 1980s when labor and political migration emerged together. In 1983, the economic policy underwent a major change and an open economy model based on export was adopted. A small amount of this migration flow comprised the labor migration as well. The continuity of the labor migration to Europe could be explained by dual labor market through which the international labor migration has been explained.[122]

In the same period, transit migrants in nature of political and labor migration came to Turkey in order to transfer to another country. İçduygu (1996) was the first to emphasize the importance of the transit migration.

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[120] Koray Tanfer, "Internal Migration in Turkey: Socio-Economic Characteristics by Destination and Type of Move, 1965-70". *Studies in Comparative International Development*.(1983):77-111.

[121] Samira Yener, "1965-70 Döneminde İllerarası Göçler ve Göç Edenlerin Nitelikleri". Ankara: Devlet Planlama Teşkilatı, (1977)

[122] Ayşe Öncü, "International Labor Migration and Class Relations" *International Linkages and National Societies*, 3(1990): 176-201.

At the dimension of internal migration, Erder (1997) displayed the importance of chain and circular migration.[123] In this type, solidarity groups have been determinative for the continuity of next migration. Chain migration caused the proliferatio of illegal demand and practices in urban areas. Erder in her sudy argued the solidarity relations about the men who struggled for benefiting the public services in the occupied peripheral areas of İstanbul by virtue of these relation networks. She also explained that immigrants who could live in solidarity groups limited to families and relatives in the 1950s were not encountered in big cities like İstanbul in 1990s. In the 1970s, solidarity between relatives was displaced by citizenship relationship.

The direction of migration and its density also have been affected in time. The general direction of internal migration has been from eastern to western part of the country.The eastern Anatolian has lost population foremost while the western Anatolian has gained the migrant population. The periodic fluctuations in the migration flow have not changed the general migration patterns.

After the 1980 Military Coup, the internal migration between 1980 and 1985 slowed up, however this moderation was ephemeral and migration movements between 1985-1990 accelerated with a higher speed relative to previous periods. After 1990, there were significant shifts in migration that was on the move in east-west axis. The examination of migration ofwomen between the ages of 15-49 put forth that there was a slow down of running along in East Anatolian region. Proliferation of East Anatolian Development Project (GAP) subjected to rural development with an investment move in the body of large-scale irrigation system in a holistic manner, eastern cities have become migration receiving cities. Furthermore, the southern part of the country began to receive more migration compared to previous periods. With the cause of migration, the loss of population in Black Sea region continued. Except Samsun and Trabzon, the cities in the region were emigration cities. Özbay and Yücel (2001) esteemed that north-south migration would be mentioned instead of the direction in east-west axis. The also offered a suggestion of redetermination of regional borders in the axis including the Central Anatolian and northern parts of Eastern Anatolian.

The shifts in the migration movements were actualized in nature of its changing pattern. One is the shuttle migration occurred between cities. The rise of urban-urban

[123] Sema, Erder, "İstanbul'a Bir Kent Kondu- Ümraniye". İstanbul: İletişim (1996); Sema, Erder, "Kentsel Gerilim". Ankara(1997)

migration may be approved. Indeed, the qualification of migration has been under change. A majority of the migrating population into big cities has been high skilled referring to a kind of brain drain from Anatolian cities to cities where the job opportunities are abounding and manifold. Interestingly, there is a portion of population that reside in countryside permanently but have intensive economic, social and cultural relations with cities. The way of getting such a relation occurs by the means of commuting, temporary and seasonal migration. The shuttle migration is more widespread between West and South Anatolian rather than between Southeastern and East Anatolian.

The migration patterns differ in accordance with the regions show the importance of regional importance of migration types as well. Herein, it has to be told that the urban fringes developed through migration in the shape of the new rural areas have the potential urban areas included into municipal borders. In this case, the differentiation between urban rural migration grows difficult. Briefly, the shuttle migration takes place as a significant type of internal migration.

Importantly, the post-1990 has been remembered with forced migration in East Anatolian cities. Actually, the migration due to security reasons and Pkk Terrorism started after 1980s massively in the form of evacuation of villages. Sema Erder defines this migration as “villager migration without villages”. Denoted with this definition is rural migrants are deprived of their hometowns. Early groups migrated in order to take refuge initially in İstanbul, in western cities. At the same time, Diyarbakır, Vam, Adyaman and Hakkari in Eastern Anatolian were the in-migratin cities whose centers had been out-migration position for a long time. Some part of the migration faced İçel and Adana.

At the end of 1990s, attached to the Turkish national memory, a catastrophe was experienced. Two consecutive earthquakes in 1999 in northwestern Anatolian caused substantial damages especially in İstanbul, Kocaeli, Bursa, Sakarya, Yalova, Bolu and Düzce. Occurrence of this catastrophe in such an economically developed region is a factor stopping migration substantially. However, it is difficult to carry industrial investments to other settlements, wih also their labor force. Besides, it is alleged that people migrate to the region in order to benefit disaster relief.

At this point, Özbay and Yücel (2001) set forth that the new industrial enterprises would locate on the transportation line between Ankara and Eskişehir or in

Trakya region instead of agglomeration on the gulf. These investments, according to them, would be decisive on the migration patterns after 2000s.

With regards to migration policies, State Planning Organization in 1970s attempted to start a research in order to distinguish the spatial structures and hierarchical staging of the settlement centers. Th research executed seven types of centers. Also there was a deficiney of intermediate stage of settlements in Eastern Anatolian region. This lack in hierarchical system shared in the increase of regional inequalities. Furthermore, many problems oin interal migration pattern have been significantly related with problems in hierarchical staging of the settlement centers. Sönmez (1996) mentioned that the acceleration of migration to İstanbul in post-1985 was due to increasing regional inequalities and dysfunctioanlizing of countrysides. [124]

The changes of administrative location of settlement centers have been a direct policy of state on migration movements. For example, introducing of a county into a province is an encouraging implementation for urbanization and migration as well.

For a brief discussion and general evaluation of internal migration history of Turkey, three main migration waves are stated. In the first period comprising between 1923 and 1950, the state-led arrangements in rural areas in order to keep the agricultural production stable and nation building in the capital expanding the modernization movement into big cities are the remarkable keystones. Along these developments, the migration movements are under the state control.

Specific to this first period, tension between rural-urban appeared due to the national identity perceived as a citizenship right given to the city middle class. Therefore, the mass migration from rural ares to cities has been considered as claiming citizenship.

In the second period including between 1950 and 1980, the second migration wave from rural to urban occurs along the industrial developments, especially in İstanbul. For this reason, this wave differs from the first wave in terms of its nature of labor migration. In these years, the urban-urban migration has been also regarded. It is also explicit that the labor migration comprises both unskilled peasant labor and high-educated labor. Another feature of the second wave is also the increase in woman migration. It indirectly refers to the permanence of man migration into cities with the attempt of household migration. Related with the rural-urban migration, it is expected in

[124] Mustafa Sönmez, "İstanbul'un İki Yüzü - 1980'den 2000'e Değişim". Ankara: Arkadaş(1996)

1980s that the rural migrants would adapt to cities, and be urbanized; however, in 1990s this expectation turns into the consideration of fragmentation of big cities by different groups and destruction of urban integrity.

The third mass migration wave in post-1985 leads to a large extent to İstanbul region that is global market-integrated. It may be asserted that middle class of small towns are to a large extent within this last migration wave. Furthermore, the migration due to security reasons and Pkk Terrorism occurred as the evacuation of Kurdish villages has social effects:s it empowers ethnic structures in cities and augments the unequal development. On the other hand, serious and effective policy and programs are needed for natural disaster inflicted foced migration. The frailty in this issue is the lack of bureaucratic organization embracing the forced migration.

Related with the bureaucracy constraints, suggestions in development plans are to a lesser extent put into practice. Sotheastern Anatolian Development Plan (GAP) has been a significant exception. Another fallacy may be the generalization of mass migration as aggregate labor migration. This generalization undoubtedly is deficient and incorrect. The causes behind migration e.g. education, health, elderliness have to be revealed attentively to introduce much unerring policies. This may not mean that state has internal migration specific policies; however, state has to develop and associate the principles for the configuration of settlement centers.

For the migration management, the origin is to understand the current dimensions of migration movements in order to analyze firstly. The most significant and major source in order to determine the migration dimensions has been Population Census before 2000s and the data gathered through the "Address-based population registration system" of TURKSTAT since 2004. Furthermore, Population and Health Research held in every five years by Institute of Population Studies of Hacettepe University is another valuable source to understand the migration patterns.

However, the data gathered by means of the sources disables to uncover the inter-urban movements and inter-provincial migration. For this reason, Institute of Population Studies started to carry out a research in 2004 by name of Migration and Internally Displaced Population Survey in Turkey (TGYONA). In the nature of national representation, the study aims to collect the recent data about outmigrated persons. In this manner, the study is supplementary and contemporary qualified.

To begin with, the study divides Turkey into three main stratifications in terms of migration movements. The first srata includes the cities (İstanbul, Ankara, İzmir,

Adana, Mersin, Bursa, Antalya, Malatya, Manisa and Kocaeli) where the migration has concentrated. The second strata, contrarily involves fourteen cities (Adıyaman, Ağrı, Batman, Bingöl, Bitlis, Diyarbakır, Elazığ, Hakkari, Mardin, Muş, Siirt, Şırnak, Tunceli and Van) in East and Southeastern Anatolian regions where the out-migration has been experienced heavily. The last strata is the remaining cities (fiftyseven) being outside of the former two groups.[125] Initially, the study reveals that the share of the population indicating that they do not want to migrate in the future is 84.5 percent. Secondly, it is seen that the trend of future immigration of population starting from younger ages until the beginning of 1950s, is higher than other ages. In terms of gender, the male population's tendency to migrate in the future (12.0 percent) is higher than the female population (9.8 percent). In context of eduation level, it is seen that as education level increases, future immigration tendency increases. The share of those who want to migrate in the future is 12.5% among the secondary school graduate population; and 17.2% among the population with high school and higher education.[126]

Beside the population characteristics, the importance of hierarchical staging of settlements is examined. The characteristics of the province and the settlement area can also influence future immigration trends as a driving and / or attractive factor. The population living in fourteen cities is likely to migrate in the future (18.3 percent) is significantly higher than the living population in ten cities (8.2 percent) and in the third group (12.2 percent). Another contribution of the study is the determination of future immigration trends based on the migration experiences that people have experienced in the past. The data show that the population with migration experience over the past two decades has a higher tendency to migrate in the future (12.9 per cent).[127]

Lastly, the direction of future immigration is examined. It appears that more than half of the population being apt to migrate and living in the so-called fourteen cities want to migrate to the ten called cities. It follows that 49 percent of the population living in ten cities and having an immigration tendency states to migrate to fiftyseven cities; and 62.4%.of population living in these fiftyseven cities state to migrate to the ten cities. Moreover, especially in 57 cities, the tendency of immigration within the same strata seems to be quite high.[128]

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[125] Report of Migration and Internally Displaced Population Survey in Turkey, Hacettepe University Institute of Population Studies, Ankara (2006): 14- 15.
[126] Ibid:97.
[127] Ibid:99.
[128] Ibid:101.

CHAPTER 5

EMPIRICAL STUDY

By reference to the regional economic growth literature discussed in the second chapter, it is important to examine the evolution of income growth. The study approaches growth in terms of income growth of NUTS II regions. For the income, per capita Gross Domestic Product and per capita Gross Value Added has been used. In the section of the research methodology, the selection of income variables has been mentioned in detail.

The study enframes the growth issue with two basic factors. One is the production capacity of the region. The other one is the human capital of the region. For both of them, the most available proxies have been selected in order to increase the explanatory power of the model. The base model of growth examined in this study has been written as follows:

$$Y_{i,t} = \beta_0 + \beta_1 Y_{i,t-1} + \beta_2 E_{i,t} + \beta_3 B_{i,t} + \varepsilon_{i,t} \quad (5.1)$$

where $Y_{i,t}$ is the growth of income, β_0 is the constant, β_n is the parameter where n= 1, 2, 3 is number of independent variables, $Y_{i,t-1}$ is the lagged income of the region at t-1 time, $E_{i,t}$ is per capita electricity used in industry in region i at t time, $B_{i,t}$ is the bachelor rate of population in the total population in region *i* at *t* time and $\varepsilon_{i,t}$ is the error term in region *i* at *t* time where *i*= 1, …, 26, is the region number and *t*= 2009, 2010, 2011 is time in year.

The study prioritizes the examination of the relationship between income growth and internal migration. Hence, the migration variables have been selected. There are one aggregate and ten sub-compositional migration variables totally.

5.1. Background of the Research

The aim of the research is to pursue the track of growth in per capita income and examine the relationship between income growth and migration. The structure of the research has been established on the accessible data that is proper for the examination of the mentioned relationship.

The background of the research has been supported by the lasting and ever-increasing inequalities in the global world. Studies building based on inequalities have constituted a wide literature in economics. The major part of these studies has investigated the inequalities between countries, transnational associations e.g. OECD, EU. However, the remaining part has focused on national inequalities; especially regional inequalities. Convergence is an approach for how the economies are approaching the same or different steady states among countries or regions within countries.

One of the main motivations in the research is to conduct the research on the scale that features the critical position of the locality. In addition, case selection is another important point. Characteristics of uninterrupted political power in last fifteen years, being a member of OECD countries, a candidate country for EU have been auxiliary states that makes Turkey a potential country to be examined. The convergence literature in Turkey is considerably wide to compare them in their methodologies, datasets, econometric models and results. The literature was given in the previous chapter.

5.2. Limitations of the Research

There are some limitations to the study. These are categorized into six groups that are: access to the data, the characteristics of the data (its aggregate nature), the lack of superposing the periods of components of data, shortening of the period of the study, different spatial units of analysis of data, and the rough information about the migration category compared to past times (pre-2000).

First, there has been experienced difficulty in access to the data. In the designed form of the model, the study would involve a large number of variables in order to explain the income growth. The pursuit of the data has sometimes led the researcher to another point that is far from the beginning of the study. In this study, such a condition has been experienced due to the generating the dataset.

Before the share of income variables by TURKSTAT, the study has been designed with tax-derived income of each province. However, there are limited variables that could explain the income growth, at the provincial level. Here is the

problem of explanatory variables that are shared out aggregately, at the regional level. It is the first factor that adversely affects the design of the study.

Besides the causes of growth, there is a limitation about the access to the data. Periods for the income and migration variables are too short to analyze the issue from a wider perspective. The income variable was announced almost recently, in 2015. One income variable (PCGDP) comprises the years between 2004 and 2014 and the other income variable comprises the years between 2004 and 2011. As the former is at the provincial level, the latter is at the regional level.

On the one hand, it is aimed to use both income variables because of the availability of comparison and provision of different perspective by their selection. In order to use them together in the model, the period is shortened to the interval between 2004 and 2011.

On the other hand, the migration data is started in the year of 2008 to 2017 (recently). However, the need for superposing the time periods of income and migration variables, the period has been shortened into the period between 2008 and 2011.

Addition to the decision of the period, there has been a problem with the decision of spatial units of analysis. While the migration and PCGDP income variable are shared out at the provincial level, PCGVA is shared out at the regional level. For the establishing a panel dataset, the selection of the unit of analysis is determined as regional level (NUTS II). This problem indicates to the issue that the aggregate data has been gathered at the geographical subscale, means at provincial levels, however, the data share has been kept at the upper scale which constraints some possibilities to be examined at subscales.

Another limitation of the study is the lack of exhaustive migration characteristics gathered by TURKSTAT. For example, in 1990 DİE -State Institute of Statistics, older name of TURKSTAT- prepared detailed questionnaires for understanding the migration flows among cities, the causes behind the migration movements, the existence of will to migrate, the difficulties experienced before/after the migration movements, etc. The data was organized for each city and the data and the report was published as city books. This attempt was relinquished, hence the number of migration studies has decreased and the scope of the studies has become narrow. The less detailed, mostly aggregated, and the starting time of data in 2008 naturally determines the way of examination of migration. Assuredly, this limitation is a particular concern to the researches using secondary data with quantitative methods.

5.3. Research Questions

It is aimed to reveal the conditions of income growth in almost the last fifteen years and put forth the relation with capital stock and human capital. Furthermore, the effects of internal migration patterns on income growth are under examination. The first attempt is revealing the income distribution at the regional level for recent ten years. The second endeavor is the assertion of the change of growth in income for provinces and NUTS II regions. The third effort is to put forth the annual change of cross-country human mobility that has been decomposed into inter-provincial, inter-regional, and intra-regional scales. The changes in migration patterns have been figured out with a recent examination and its decomposition that might be novel.

The research concurrently includes econometric analysis and spatial tests to reveal the existence of significant relations between growth in income and capital stock, human capital and age groups, gender and educational attainment of migration.

5.4. Research Methodology

In the research, quantitative techniques are used. As determined with the help of existing international and Turkish literature and the potentials ensured by the case of Turkey, the frame is determined to embrace the entire country at the provincial and the NUTS II region levels.

The occasion of choosing the units of analysis as a province and region are to reveal the conceivable differences between the main (regions) and sub (provinces) elements of the set. It further opens up a setting to analyze the rising or falling cluster(s) in regions, rising or falling regions. By this means, a priori interactions have been tested and unexpected relations have been carried out. These emerging interactions cause a cross-country reexamination of the growth-migration relations and migration patterns.

Intrinsically, the access to appropriate but different data in a two-year period reestablishes the structure of the research. In the end, the most proper dataset to examine the research questions is selected. The main resource of the data is the official databank

of TURKSTAT.[129] Based on NUTS classification, the unit of analysis are NUTS II (26 regions) and NUTS III level regions (81 provinces) of Turkey.[130]

The variables included in the dataset comprise both provinces and NUTS II regions. The data is organized in the form of panel data. For the first year of the analysis period, in the first column NUTS II (starting with TR10) and III regions (starting with Adana) are listed in the alphabetical order. Each column sequentially shows the variables included in the models.

At the beginning of the dataset generation, there was no official data indicating per capita income and any other resembling data for income. After that, the study has been started to generate per capita income of provinces. To achieve this aim, tax assessment was considered to substitute the per capita income. Data of tax assessment per taxpayer was available in the databank of official Revenue Administration website. In the main page, the statistical database was given.[131] It includes income, real property income, and corporate taxes declared between 2000 and 2014 at the provincial level.

After organizing the tax-based data, it was analyzed whether it showed similarities with the general tendency of the income distribution. The expectation intrinsically was the east-west division in per capita income. However, the derived data contrasted with the expected outlook. The tax assessment depends upon the declaration of taxpayers and the exclusion of informal economic activities being out of taxability.

In order to show this contradiction, the related visualization is displayed below. In the legend of spatial configuration figured out below, the content is organized

[129]At the main page of TURKSTAT (http://www.turkstat.gov.tr/Start.do), under the submenu of databases, internal migration is selected. At the opened page, the subject is selected as "Adress Based Population Registration System Results". The indicator beneath is selected as internal migration. When selecting, 12 sub categories are shown to choose a measurement. In this section, in and out migration based on gender and age group (five year age groups) are available between the years of 2008- 2017 at NUTS I, II and III levels, the amount of net migration, migration rate, educational status of in migrated population based on age group, gender, education level for the preceding time- space determination, in migration across NUTS I level, out migration across NUTS I level, in migration across NUTS II level, out migration across NUTS II level, in migration across provinces, out migration across provinces. After choosing the measurement, dimensions should be added. By clicking the forward button, the next pages serve time and region selections. The last step is creating the report.

[130] The Nomenclature of Territorial Units for Statistics is a geographical nomenclature subdividing the economic territory of the European Union (EU) into regions at three different levels (Nuts 1, 2 and 3 respectively, moving from larger to smaller territorial units). Determination of NUTS is an effort to establish a common classification of territorial units for statistics. In Turkey, according to the NUTS levels, regions are defined according to their economic, social and geographical aspects of the neighbor regions, regional development plans and population sizes. NUTS I level comprises of 12 regions, NUTS II level includes 26 regions, and NUTS III level includes 81 provinces.

[131]The data was recorded from the official website of the institution, in address of http://www.gib.gov.tr/yardim-ve-kaynaklar/istatistikler

according to the z scores of the data, and determined in the particular distances (0.5, 1 and 1.5 standard deviation) from the average:

$$z = \frac{x - \mu}{\sigma} \tag{5.2}$$

where x is related data vector, μ is the average of the data, and σ indicates the standard deviation.

The numbers in the parenthesis indicate the number of provinces representing the related category (Figure 5.1,5.2).

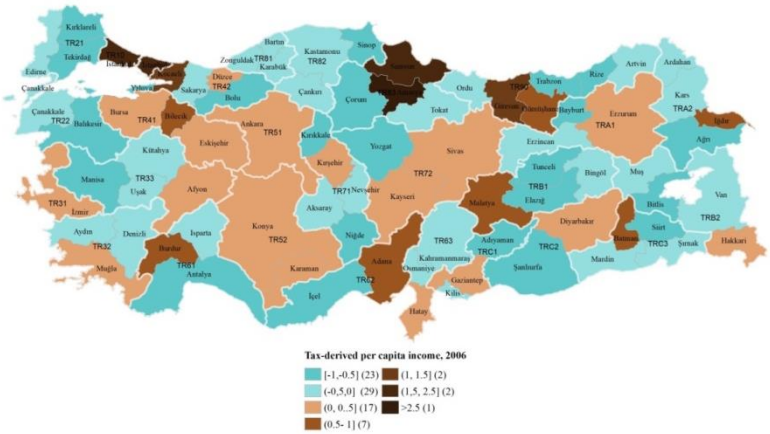

Figure 5.1. Tax-derived per capita income in 2006.

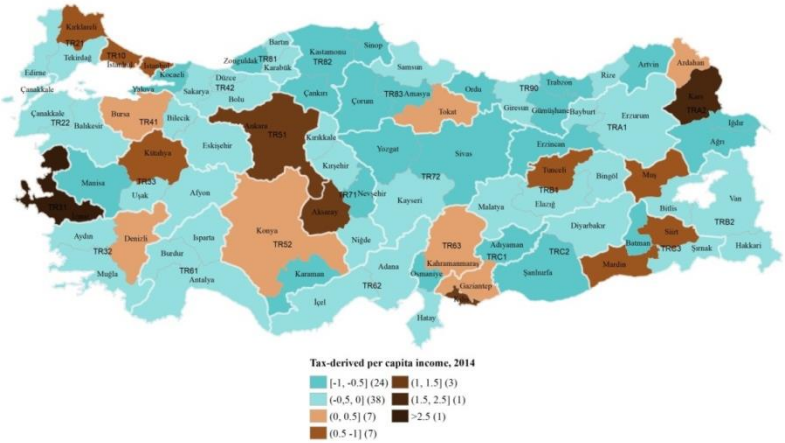

Figure 5.2. Tax-derived per capita income in 2014.

The Figures 5.1 and 5.2 are derived to show the changes in relative positions of provinces in terms of tax base per capita income. The changes are grouped in terms of standard deviations. The related years of figures provide nearly a decade change at national level. Comparison of figures shows that there is a critical decline in the western

part, and a partial rise in the eastern part is observed. The middle part of the country also is in rising.

The general expectation is revealing the growth poles and east-west income differences. It may be possible to show the east-west dualism in the initial year; however, the distribution in 2014 (Figure 5.2) demonstrates a number of clusters different from the initial one (Figure 5.1).

The general picture derived from tax-based per capita income distribution in ten years at national level host some obscurities. Therefore, the first attempt failed. Meanwhile, luckily TURKSTAT shared out per capita Gross Domestic Product (PCGDP) at the provincial level between 2004 and 2014. Henceforth, the empirical study was configured according to PCGDP data. In order to set up the dataset, the official records of TURKSTAT from its official website were pooled.

However, publishing of per capita GDP opened up a much-debated issue in the economic environments. The reliability of per capita GDP data has been highly criticized. The nature of the data, the method started to be used for calculation was reviewed by a number of canonic economists.

In a review, economist Korkut Boratav says that the growth rates were compared. According to the old series, industrial production index between 2010 and 2015 went up with 5.3% rate, and value added of the industrial sector was 5.4% rate; however, in the new national income series, the average growth rate of value added of industry sector between 2010 and 2015 went up with 8.3% rate. The reason for this economic jump from national income to value added was still not explained. It may be because of import substitution instead of foreign input or a sudden technological breakthrough.[132]

Boratav states that national income calculation of TURKSTAT is defective, includes unreliable elements. He mentions that using directly the data will cause troubles. Some revisions and corrections by economists do not ensure common databases. However, in this study, TURKSTAT's series are trusted since it is an official source of statistics.

It was decided to include the data on per capita GVA into the dataset in order to provide a balance within the research. However, the fundamental indicator of economic growth is real per capita GDP. Its growth from one to next year means the rise in the

[132] A newspaper article retrieved from https://www.birgun.net/haber-detay/milli-gelir-revizyonu-arizalidir-153403.html, in 4.10.2017.

rate of economic growth. The economic growth rate is defined by the percentage growth rate of real per capita GDP. By using real per capita GDP, a misleading effect of inflation gets rid of because revenue product is determined with fixed prices.[133]

Table 5.1 povides the structure of the dataset including the variables, definition, scope and data source. The official definitions of the variables by TURKSTAT are given. The variables of per capita GDP, per capita GVA, the growth of both income data, their time lags, bachelor degree rate of total population, per capita ele ctricity use in industry encompass the base model.The fundamental input of the model on the base model is the net migration rate. Furthermore, the composition of net migration rate in accordance with age, gender, and education profiles are included in the model.

Table 5.1. The structure of the dataset.

Variable	Definition	Scope	Data Source
GVA	Per capita GVA deflated from CPI	2004-2011	TURKSTAT
GVA_LAG	Per capita GVA of the previous year	2005-2011	own calculation
GVA_GROWTH	The difference between the successive values of linearized GVAs	2004-2010	own calculation
GDP	Per capita GDP deflated from CPI	2004-2014	TURKSTAT
GDP_LAG	Per capita GDP of the previous year	2005-2014	own calculation
GDP_GROWTH	The difference between the successive values of linearized GDPs	2004-2013	own calculation
BACH	The ratio of population with undergraduate and upper degrees to total population	2008-2016	TURKSTAT
PCELEC	Per capita electricity usage of industrial enterprises	2004-2016	TURKSTAT
NMR	Ratio of the amount of total migrating population to total population	2008-2017	TURKSTAT
NMR_CHILD	Ratio of the amount of migrating population under the age of 15 to total population	2008-2017	TURKSTAT
NMR_STUDENT	Ratio of the amount of migrating population between the ages 15-24 to total population	2008-2017	TURKSTAT
NMR_YOUNGER ADULT	Ratio of the amount of migrating population between the ages of 25-44 to total population	2008-2017	TURKSTAT
NMR_OLDER ADULT	Ratio of the amount of migrating population between the ages of 45-64 to total population	2008-2017	TURKSTAT
NMR_SENIOR	Ratio of the amount of migrating population above the age of 64 to total population	2008-2017	TURKSTAT
NMR_FEMALE	Ratio of the amount of female migrating population to total population	2008-2017	TURKSTAT
NMR_MALE	Ratio of the amount of male migrating population to total population	2008-2017	TURKSTAT
NMR_LOWEDU	Net migration rate of primary school graduates and below	2009-2017	TURKSTAT
NMR_MIDDLEEDU	Net migration rate of secondary education and high school graduates	2009-2017	TURKSTAT
NMR_HIGHEDU	Net migration rate of population with bachelor degree and above	2009-2017	TURKSTAT

[133] Orhan, O. Z., S., Erdoğan, "*Genel Ekonomi*" Umuttepe Press, 9. Edition, (2016)Kocaeli.

Additionally, in some analysis, regional dummy variables are used. The number of dummies depends on the number of regions. Due to the number of 26 NUTS II regions, 25 regional dummy variables are identified.

The internal migration, according to TURKSTAT, is defined as: in the recent year changes in permanent residence addresses in certain areas (territories, provinces, districts, etc.) within the country borders have been defined as internal migration.

The in-migration is the migration to a province from other provinces. The out-migration is the migration of a province to other provinces. The net migration is the difference between the in and out-migration.

If a specific province receives more than its out-migration then the net migration is positive otherwise, negative. The net migration rate is the amount of net migration for every thousand people that can migrate.

The execution phase of the research starts with the basic steps. First of all, the variables were processed in order to create coherence within the dataset e.g. linearization of PCGDP, PCGVA, deflated from Consumer Price Index. Net migration rate is decomposed into its composition according to age, gender, and education profile groups. In the basis, there are two explanatory independent variables that are bachelor rate (BACH) and per capita electricity used in the industry (PCELEC). The aggregate form of migration is the net migration rate that covers a period between 2008 and 2017.

The lagged income variableas are the value of previous year. It is used to see the time lagged effects. The growth of income variables is the difference of the values of successive years, in other words annual increase or decrease.

In the age main group, five sub-categories are: below 15 (child), between 15-24 (student), between 25-44 (young adult), between 45- 64 (older adult), and above 65 (senior). Low education profile consists of groups of illiterate, literate but not finishing school, primary school graduate, and elementary school graduate. Middle education profile involves secondary education and high school graduates. High education profile consists of groups of undergraduate or bachelor, second cycle (master) degree, and third cycle (PhD) degree.

The first attempt of the empirical studies generally starts with the analysis of the base part of the dataset. Inevitably, analyzing the data in a descriptive manner and getting first impressions about the data (Table 5.2).

5.5. Descriptive Analysis

Based on Table 5.2, PCGDP and PCGVA are increasing. The highest PCGVA of the region (TR10-İstanbul) grows 17.2 times of the initial PCGVA (TR51-Ankara) while the highest PCGDP (TR10) grows 1.4 times of the initial PCGDP (TR51). The mean of PCGVA grows 4.4 times of the initial value in 2009. The mean of PCGDP grows 1.4 times of the initial value in 2009.

Table 5.2. Descriptive Statistics in 2011 and 2009.

	MEAN	MEDIAN	MAX	MIN	STDDEV	JARQUE-BERA	PROB.
PCGDP	15563	14080	31165	7412	6084	3.30	0.19
PCGVA	6984	1488	131554	915	25466	567.98	0
PCELEC	0.07	0.069	0.15	0.03	0.03	5.84	0.05
BACH	-0.004	-0.0035	0.012	-0.028	0.01	0.97	0.61
NMR	-0.003	-0.0043	0.011	-0.030	0.009	3.07	0.22
NMR_CHILDREN	-0.0008	-0.0006	0.003	-0.012	0.003	39.32	0
NMR_STUDENT	-0.001	-0.002	0.005	-0.007	0.003	0.84	0.66
NMR_YOUNGADULT	-0.001	-0.001	0.004	-0.008	0.003	0.89	0.64
NMR_OLDERADULT	0.0001	5.00E-5	0.002	-0.003	0.001	5.97	0.05
NMR_SENIOR	2.69E-5	0	0.0004	-0.0006	0.0002	1.56	0.46
NMR_FEM	-0.002	-0.002	0.006	-0.015	0.005	3.18	0.20
NMR_MALE	-0.001	-0.002	0.005	-0.014	0.004	2.84	0.24
NMR_LOWEDU	-0.001	-0.001	0.005	-0.014	0.004	10.18	0.006
NMR_MIDEDU	-0.001	-0.001	0.004	-0.004	0.002	1.42	0.49
NMR_HIGHEDU	-0.0005	-0.0005	0.002	-0.003	0.001	1.18	0.55
	MEAN	MEDIAN	MAX	MIN	STDDEV	JARQUE-BERA	PROB.
PCGDP	10908	10126	22072	5275	4118	2.97	0.23
PCGVA	1601	1128	7619	711	1430	165.41	0
PCELEC	0.06	0.05	0.13	0.02	0.02	10.82	0.004
BACH	-0.003	-0.003	0.009	-0.03	0.009	3.70	0.16
NMR	-0.002	-0.003	0.009	-0.020	0.008	0.69	0.71
NMR_CHILDREN	-0.0004	-0.0001	0.003	-0.006	-0.002	4.13	0.13
NMR_STUDENT	-0.0008	-0.001	-0.003	-0.006	0.002	0.73	0.69
NMR_YOUNGADULT	-0.001	-0.001	0.004	-0.007	0.003	1.06	0.59
NMR_OLDERADULT	0.0002	0.0001	0.005	-0.0016	0.0013	101.71	0
NMR_SENIOR	9.60E-5	0	0.001	-0.0002	0.0003	75.34	0
NMR_FEM	-0.001	-0.001	0.004	-0.01	0.004	0.64	0.73
NMR_MALE	-0.001	-0.001	0.006	-0.01	0.004	0.72	0.70
NMR_LOWEDU	-0.0004	-0.0007	-0.006	-0.008	0.003	0.36	0.84
NMR_MIDEDU	-9.60E-5	0.0002	0.005	-0.004	0.002	0.41	0.81
NMR_HIGHEDU	-0.0004	-0.0002	0.0008	-0.002	0.0008	1.09	0.58

According to Table 5.2, the mean of net migration rate decreases. The mean of bachelor rate decreases. The mean of per capita electricity use in industry increases as its maximum regional use increases.

The first act is the examination of income data to execute preliminary facts. PCGDP and PCGVA were analyzed within the period. The scope for the data of PCGDP is between 2004 and 2014, and for the data of PCGVA is between 2004 and 2011. The scopes of data are limited with the very last decade of publication of related data.

In order to examine the income data, using Coefficient of Variation is a favorite way to get first impression about the related data. CoV is a statistical measure of the dispersion of data points in a data series around the mean. The moderation of the track is interpreted as the decreasing of inequalities among units, which might be a signal for convergence.

Firstly, Coefficient of Variations of PCGDP and PCGVA were analyzed. This analysis may also be significant to compare the provincial and regional data because it could open up the capacities of regions in the face of limited period. The generalization within the group of cities may hinder some facts.

The Figure 5.3 shows the changes of PCGDP at the provincial and PCGVA at the provincial and regional levels, respectively. The time intervals are not similar. PCGVA is available between 2004 and 2011 while PCGDP is available between 2004 and 2014. In Figure 5.3, it is seen that PCGDP falls from 0.42 to 0.37 in ten years. The trend has a downward tendency. The line of PCGVA also moves along below PCGDP and falls from 0.40 to 0.37 in 7 years. The lowest point coincides after 2009 crisis. This decrease is due to the global economic crisis. As a general comment, the lines nearly show the identical courses.

It could not be accepted as a significant change; however, the trend had a downward tendency. According to the line of PCGVA, the value felt from 0.40 to 0.37 in seven years. The lowest point coincided after 2009 crisis. This decrease might be due to the economic crisis affecting globally. The lowest value in PCGVA was revealed after 2009 Crisis. Except the rise of PCGVA after 2010, the lines nearly showed the identical courses.

In the wake of first impression about the nature of income data, the relation of change of PCGDP in time with reference to initial PCGDP was investigated. In Figure

5.4, the horizontal axis represents PCGDP and the vertical axis represents the growth in PCGDP.

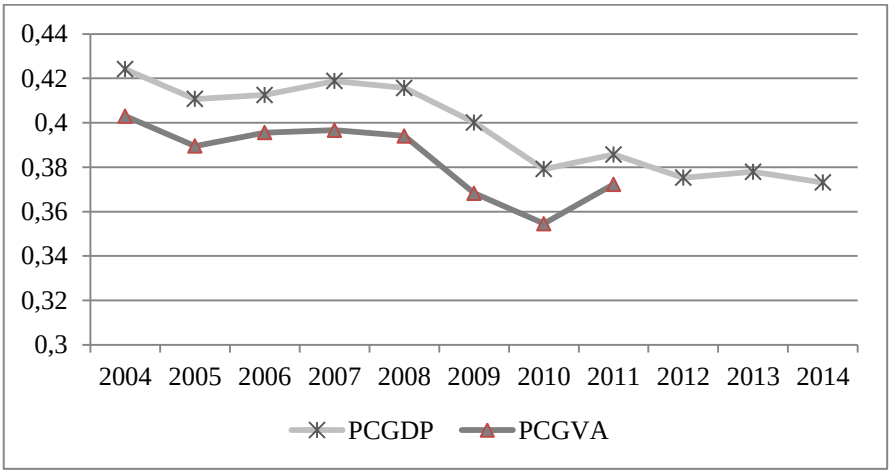

Figure 5.3. Coefficient of Variations of PCGDP at provincial level between 2004 and 2014 and PCGVA at regional level between 2004 and 2011.

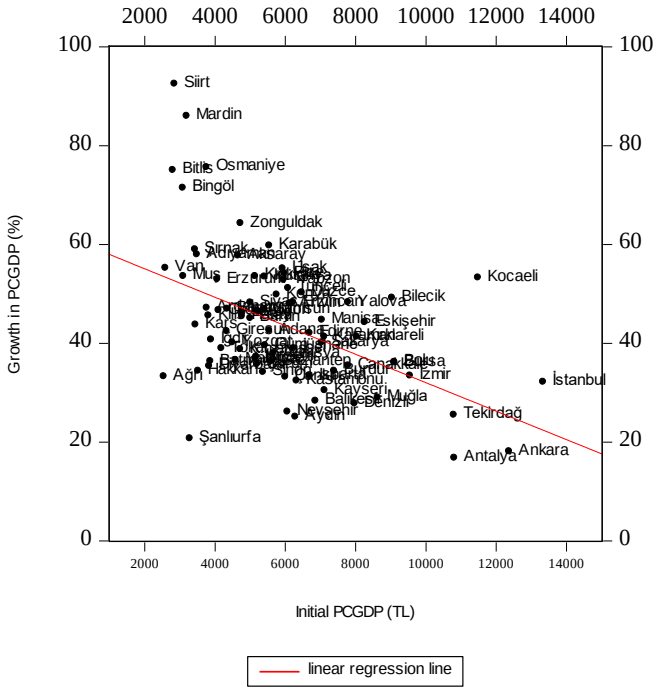

Figure 5.4. The change of growth in PCGDP between 2004 and 2014 relative to initial PCGDP at provincial level.

According to the Figure 5.4, it was figured out that provinces with lower initial PCGDP had higher growth in PCGDP. The provinces with higher current PCGDP had lower growth in PCGDP. The Figure 5.4 may support the Coefficient of Variations of PCGDP. The Figure 5.5 was reproduced once again at the regional level.

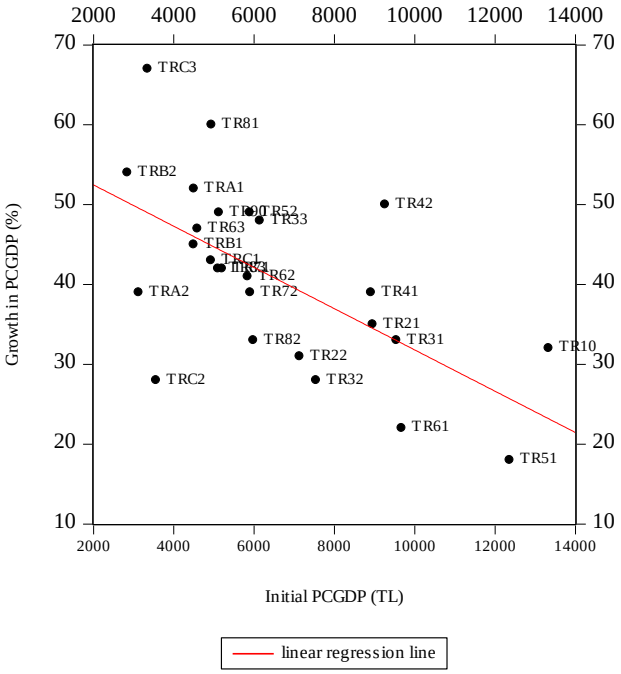

Figure 5.5. The change of growth in PCGDP between 2004 and 2014 relative to initial PCGDP at regional level.

The comparison of Figures 5.4 and 5.5 revealed that at both levels PCGDP were scattering around the linear regression trend line; however, the interval of data of Figure 5.4 was greater than Figure 5.5 that meant income distribution of provinces had a larger interval of change than regions.

PCGVA values of regions were scattering within a growth interval of 30%. The outlier in data was TRC3 region including the cities Mardin, Batman, Şırnak, Siirt that had over 70% growth with respect to the relative lower initial PCGVA.

Comparing Figures 5.5 and 5.6 showed that the trend lines had different slopes. In Figure 5.5, PCGDP changed between 20-70% nearly while in PCGVA changed in a less wide interval between 10-40%. It is stated that PCGDP is much descriptive than PCGVA in context of income convergence. The simple method used in the *Beta*-convergence analysis is the examination of the relationship between the growth rates and the per capita GDP of the initial year.[134]

If a negative correlation has been observed, this is an indication of convergence. As can be seen in Figures 5.4, 5.5 and 5.6, there were negative relationships between growth rates and per capita GDP and per capita GVA. This finding suggests that *Beta* convergence occurs.

[134]İsa Sağbaş, "Türkiye'de Kamu Harcamalarının Yakınsama Üzerindeki Etkisi", *Afyon Kocatepe Üniversitesi, İ.İ.B.F. Dergisi* 4.2(2002): 220.

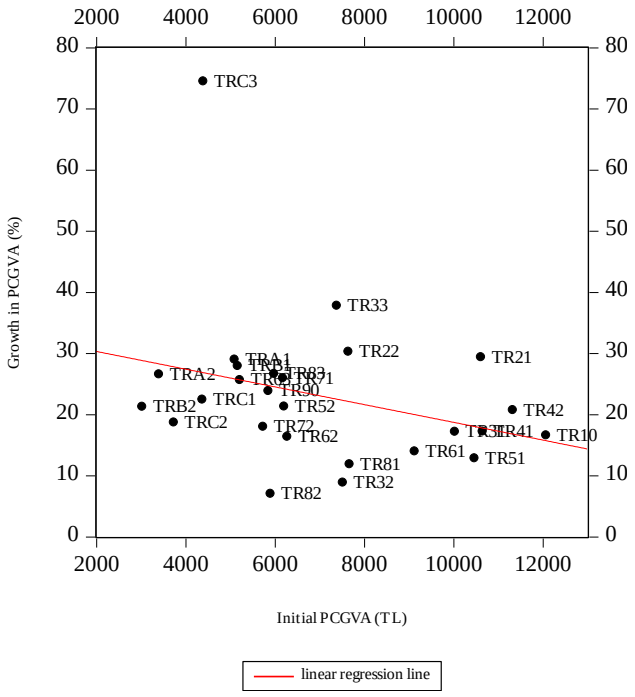

Figure 5.6. The change of growth in PCGVA relative to initial PCGVA at regional level in 2004-2011.

Secondly, the migration data was analyzed to obtain preliminary implications about its characteristics. To understand the change of the mobility pattern in time, an index is calculated. The principle of the calculation is based on the annual average of provincial and regional total in-migration (or out-migration) relative to total country population.

The aim of the inter-provincial human mobility index is to monitor the changes in human mobilities across the country. The index values of each year show the annual human mobility index that is the ratio of total in-migration population of provinces relative to the total national population.

In Table 5.3, the lowest points in the trend occurred in 2009 and 2012. After 2012, the trend has risen. It is difficult to make any inference due to the limited time interval; however, there is a smooth move in migration motivation. The fall in 2009 may strongly be explained by the outbreak of global economic crisis in 2008.

The inter-provincial human mobility index is calculated as:

$$IPHMI_t = \frac{\sum_{i=1}^{81} AIP_{i,t}}{TCP_t} \tag{5.3}$$

Table 5.3. Annual Inter-provincial Human Mobility Index between 2008-2017.

Year	IPHMI
2008	0.0318
2009	0.0308
2010	0.0320
2011	0.0324
2012	0.0306
2013	0.0331
2014	0.0345
2015	0.0345
2016	0.0328
2017	0.0332

where $IPHMI_t$ is inter-provincial human mobility index per year that equals to the $AIP_{i,t}$ (the amount of in-migrated population for each province) divided by TCP_t (total country population for a year). The indices i and t indicate provinces and years, respectively.

Beside the inter-provincial human mobility index, the inter-regional migration movement was analyzed to see the differences between inter-provincial and inter-regional movement dynamics.

The inter-regional human mobility index is calculated as:

$$IRHMI_t = \frac{\sum_{i=1}^{26} AIP_{i,t}}{TCP_t} \tag{5.4}$$

where $IPHMI_t$ is inter-provincial human mobility index per year that equals to the $AIP_{i,t}$ (the amount of in-migrated population for each region) divided by TCP_t (total country population for a year). The indices i and t indicate NUTS II regions and years, respectively.

Table 5.4. Annual Inter-regional Human Mobility Index between 2008-2017.

year	IRHMI
2008	0.0294
2009	0.0285
2010	0.0296
2011	0.0301
2012	0.0283
2013	0.0305
2014	0.0319
2015	0.0320
2016	0.0303
2017	0.0307

Comparison of Tables 5.3 and 5.4 shows that inter-regional human mobility index is almost identical with inter-provincial human mobility index. The reason of the similarity is that great portion of inter-provincial migration occurs among the provinces of different regions.

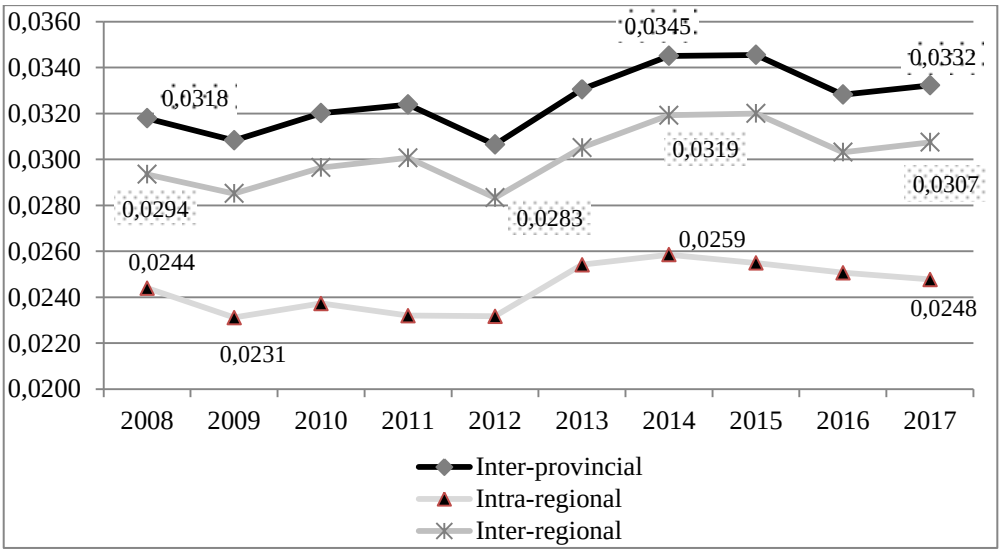

Figure 5.7. The trends of inter-provincial, inter-regional and intra-regional human mobility indices between 2008 and 2017.

Table 5.5. Annual changes of human mobility indices.

year	inter-provincial	inter-regional	intra-regional
2009	-0.0302	-0.0284	-0.0525
2010	0.0384	0.0394	0.0264
2011	0.0117	0.0144	-0.0222
2012	-0.0537	-0.0578	-0.0012
2013	0.0786	0.0771	0.0969
2014	0.0440	0.0462	0.0173
2015	0.0011	0.0024	-0.0141
2016	-0.0501	-0.0528	-0.0165
2017	0.0123	0.0143	-0.0119

As seen in Figure 5.7, the trends of inter-provincial and inter-regional human mobility indices had similar representations. The difference between inter-provincial and inter-regional human mobility indexes corresponded to intra-regional human mobility index that was quite lower than the two previous indices. The intra-regional trends showed that migration tend to occur mainly from a province out of its regions.

In order to illustrate the changes more comprehensible, the line chart was used. It contributed to the Figure 5.7 and stressed the eccentric move of intra-regional

migration. In addition to provincial and regional human mobility indices, the migration patterns were analyzed in terms of their components. In detail, the net migration rate of age, gender and education profiles are available between 2009 and 2017. The first component of the analysis is the age group consisting of child (0-14, student (15-24), younger adult (25-44), older adult (45-64) and senior migrating population.

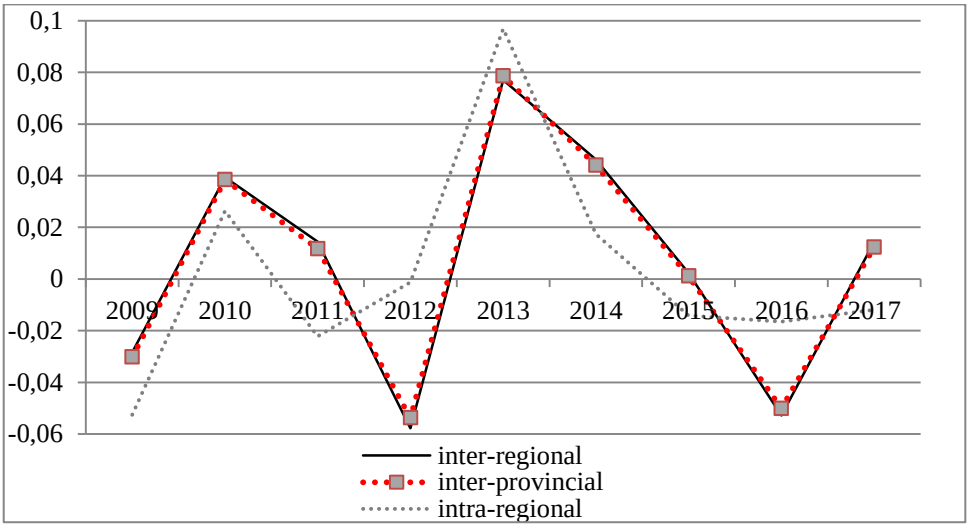

Figure 5.8. Annual changes of inter-regional, inter-provincial and intra-regional human mobility indices between 2009 and 2017.

The Figure 5.9 ensures to realize the similarities and differences in mobility between age groups. First of all, it was revealed that the older populations (45-64 and 65+) were less mobile than the younger population. Another argument was that trend child (0-14) was the offset of the younger adult trend (25-44). This could be explained with the accompaniment of parents to their children in migration. Moreover, the student migration has been in a gradual increase. It could be explained that migration occurs for educational opportunities.

Secondly, the analysis is done with respect to educational attainment in three groups. The low educated group includes elementary school graduate and below, the middle educated group consists of secondary school, high school graduate and their equivalents, the high educated group comprises vocational school, undergraduate degree and graduate degrees. The Figure 5.10 introduces the education profiles of migrating population.

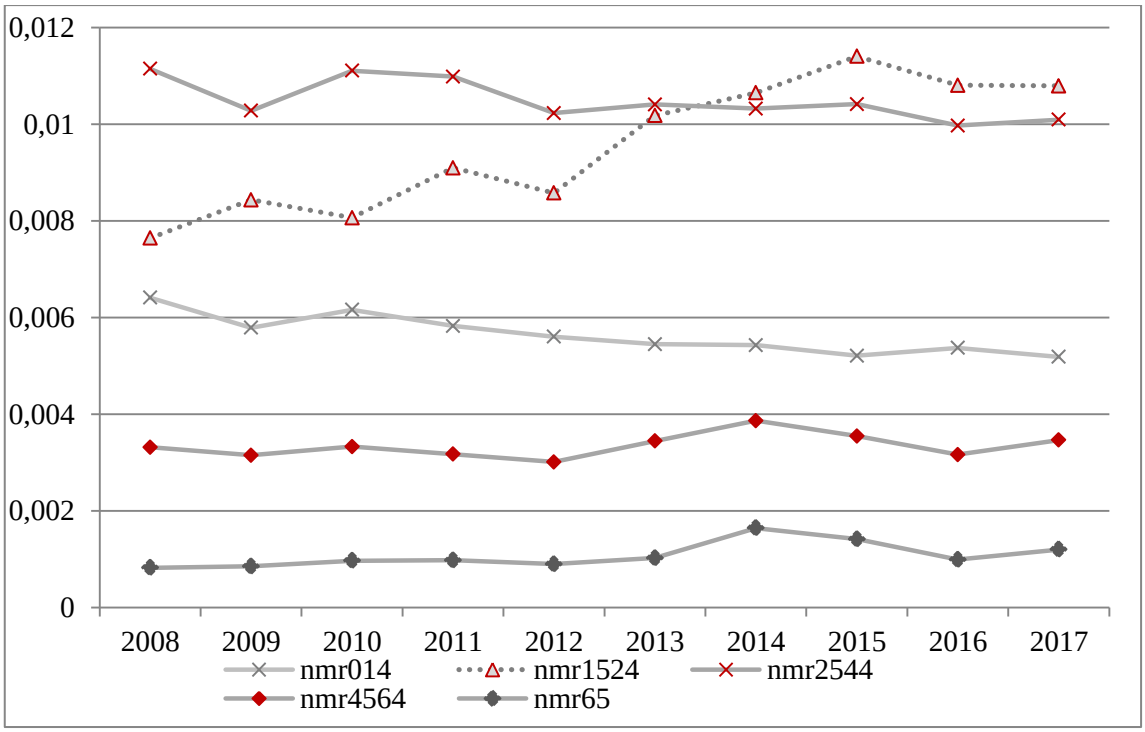

Figure 5.9. Annual Inter-regional Human Mobility Index based on Age Groups at regional level between 2008 and 2017.

It is regarded that population with high educational attainment becomes more mobile in time. The mobility of middle education group is also increasing. However, the low educated group, especially after 2014 is less mobile than the other groups. Low educated group shows a falling tendency in general, as the other groups show increasing move.

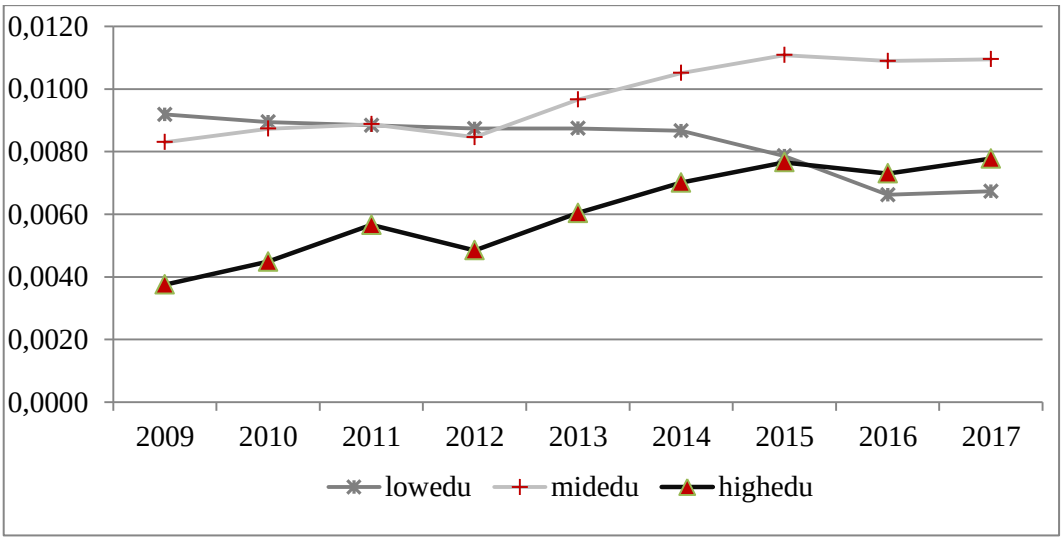

Figure 5.10. Annual Inter-regional Human Mobility Index based on Educational Attainment between in 2009 and 2017.

The serial analyses have been ended up with analysis of gender issue. The Figure 5.11 shows female and male migration patterns. It is considered that female migration is lower than male between 2008-2010; however, after 2012 the female migration is followed above he male migration. In general, male and female patterns of migration have almost similar tracks. In the next section, the spatial exploratory analyses have been applied to examine the spatial patterns, relations, etc.

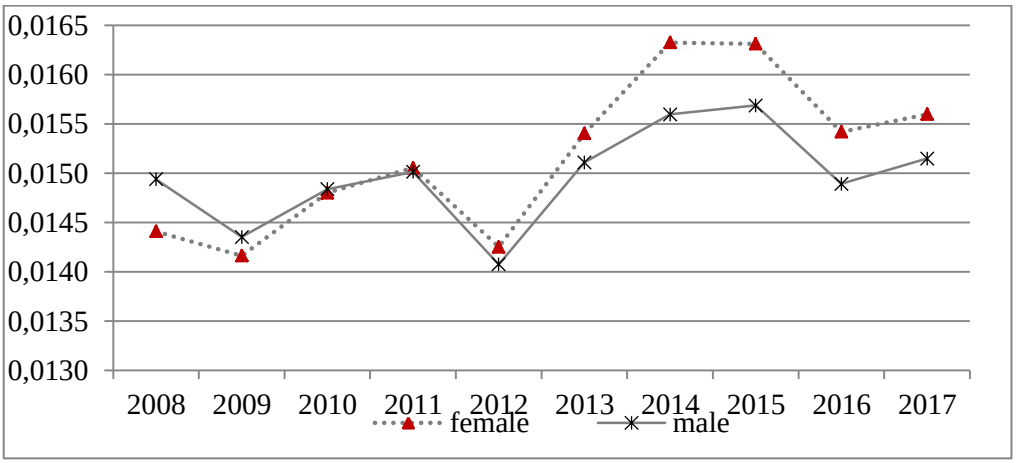

Figure 5.11. Annual Inter-regional Human Mobility Index based on Gender at regional level in 2008 and 2017.

5.6. Spatial Exploratory Analysis

In order to support the descriptive analyses, a further analysis has been done with the aim of a spatial exploration with the instrument of mapping Turkish cities and regions. In this spatial analysis, per capita incomes (per capita Gross Domestic Product and per capita Gross Value Added) and the migration factors in three different categories (age, gender, educational attainment groups) with ten features (0-14, 15-24, 25-44, 45-64, 65+ under age, male and female under gender, and low, middle, high-education under educational attainment) have been analyzed.

Each variable in the spatial analysis are organized based on its smallest spatial unit and the widest time period. To sort the space-time indices out, 81 provinces in 2004 and 2014 for per capita GDP, 26 NUTS II regions in 2004 and 2011 for per capita GVA, 81 provinces for all migration categories but in 2008 and 2017 for age and gender, and in 2009 and 2017 for educational attainment were analyzed.

The maps were generated in ArcMap program. In each map, the distribution of values is specified according to calculated z scores. Additionally, in/out-migration cities are represented in the numbers as well. The post at bottom-right corner contains descriptive statistics about the relevant variable.

Each map contains the names of cities, NUTS II regions, the boundaries i.e. bold, white line represents the boundary of NUTS II regions while the thinner, different colored line represent boundary of cities. The representation of boundaries of cities and regions provide the opportunity to evaluate the behaviors of cities in their regions with which they are in accord. In this manner, it is revealed which cities are differentiating or similar in their regions.

According to Figure 5.12, the annual average of per capita GDP in 2004 is 5839 TL. The median city is Gümüşhane (5419) below the country average. It means that it is right-skewed distribution. Per capita GDP increases at a rate of 38%.

The highest per capita GDP in 2004 pertain to İstanbul (13337), Ankara (12336), Kocaeli (11483), Antalya (10808), and Tekirdağ (10791), respectively. The lowest per capita GDP, on the other hand, belong to Ağrı (2534), Van (2586), Bitlis (2841), Siirt (2841), and Bingöl (3081), respectively. The numbers in the parenthesis are in Turkish Lira. To interpret the extreme values, the cities are generating clusters. The high PCGDP group explains the industrial axis with the hinterland of İstanbul, and İzmir-Antalya coastal axis with tourism capacity.

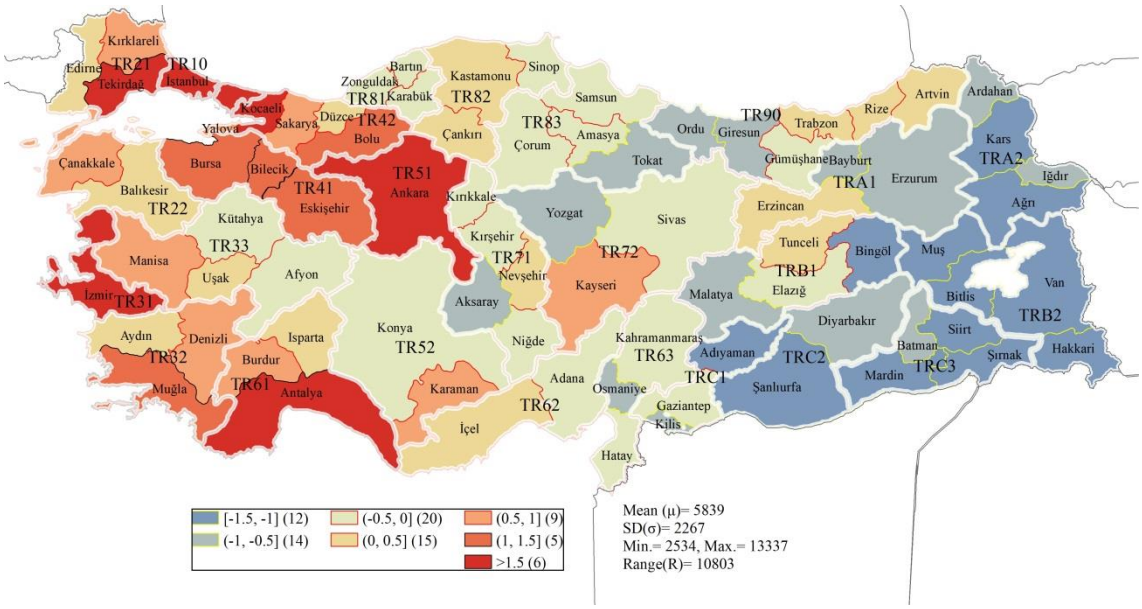

Figure 5.12. Per capita Gross Domestic Product at provincial level in 2004.

Furthermore, İzmir with its hinterland Manisa and Uşak as an industrial hub; Denizli as another industrial city; Burdur and Isparta in the hinterland of Antalya; Karaman with the hinterland of İçel and pairwise cities Kastamonu, Çankırı; Kayseri, Nevşehir; Erzincan, Tunceli, and Artvin, Rize, Trabzon are clusters as neighbor cities. The low GDP group, on the other side is almost the entire TRA1, TRA2, TRB2, TRC3 TRC1 and TRC2. In North-eastern Anatolian region (TRA), Erzincan is above the average, similar to Tunceli in Middle-eastern Anatolian region (TRB). The entire body of Southeastern Anatolian region (TRC) is under the overall average.

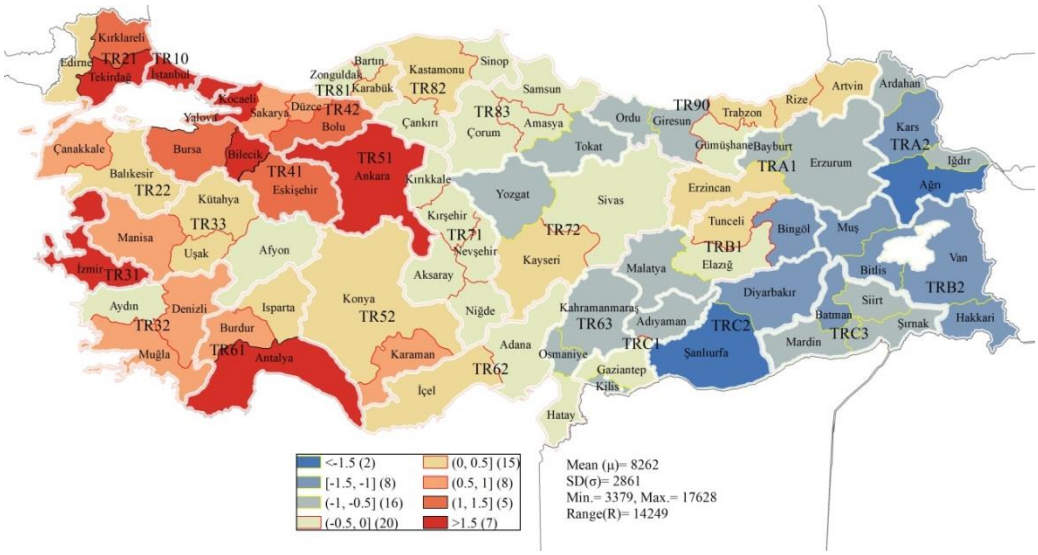

Figure 5.13. Per capita Gross Domestic Product at provincial level in 2014.

In Figure 5.13, compared to 2004, per capita GDP increases at a rate of 41% in a decade. The median city is Amasya (7801) below the country average. It means that it is right-skewed distribution. The highest per capita GDP in 2014 pertain to similar cities, compared to Figure 5.12. It means that the spatially distribution of per capita income empowers the positions of so-called cities. In that vein, the low GDP group nearly remains stable. In Figure 5.14, the growth rates in per capita GDP in ten years are depicted. The average national growth rate between 2004 and 2014 is 44%. The growth rate distribution gives an opposite illustration, contrary to Figures 5.12 and 5.13. Based on the Figures, cities with lower initial per capita GDP have greater growth rates in PCGDP (Figure 5.14) relative to higher initial PCGDP.

The western Marmara (Çanakkale, Balıkesir, The Aegean (İzmir, Aydın, Muğla), southern cities (except Adana and Hatay), Western Black Sea (Kastamonu, Sinop) coastal cities are in the first two lower groups of growth rates. More than 40% of

the initial per capita GDP are clustered in the middle part enclosed by the metropolitan cities İzmir, Ankara, Antalya, İçel. Addition to that, a cluster generated in the eastern part of the country i.e. TRA1, TRB2, TRC3. In reference to Figure 5.12, cities with lower initial per capita GDP have greater growth rate in PCGDP relative to higher initial PCGDP.

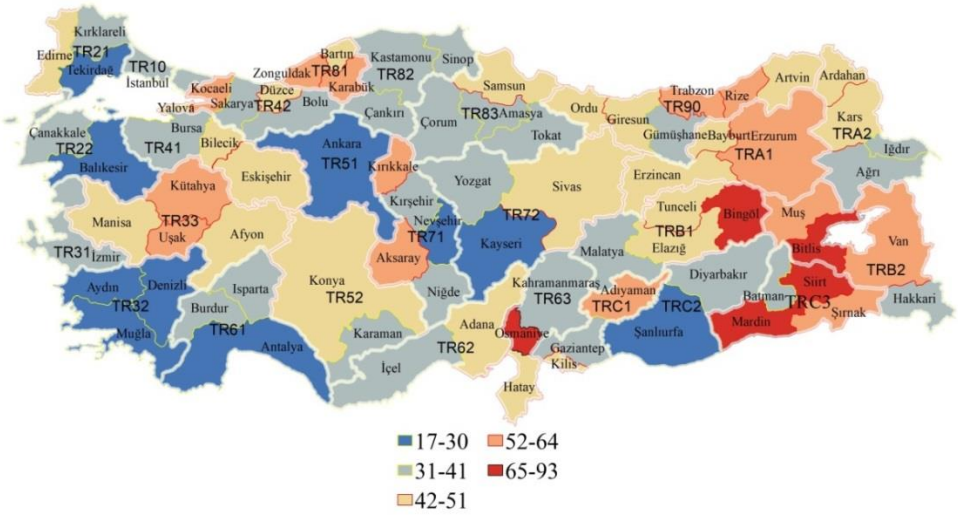

Figure 5.14. Growth rates (%) in per capita Gross Domestic Product at provincial level between 2004 and 2014.

Based on Figure 5.14, the metropolitan cities such as Trabzon, Erzurum, Kocaeli, Van have more than 50% growth rate. The highest growth rates in the overall country belong to Bingöl, Bitlis, Siirt, Mardin, and Osmaniye that are hinterlands of industrial centers Diyarbakır, Gaziantep, and Adana. Furthermore, Kütahya and Uşak in the hinterland of Manisa, Kocaeli in the hinterland of İstanbul, Kırıkkale and Aksaray in the hinterland of Ankara have grown within 52-64% rates. On the contrary, Osmaniye, Mardin, Siirt, Bitlis and Bingöl have the highest growth rates. In general, it is asserted that there has been an eastern cluster that has higher growth rates (more than 52%).

In 2004, referring to Figure 5.15, the lowest per capita Gross Value Added belongs to TRA2, TRB2, TRC3 (Northeastern, and Middle-Eastern, Southeastern Anatolian regions, respectively) while the highest PCGVA pertains to TR10 (İstanbul), TR42 (Kocaeli, Yalova, Sakarya, Düzce, Bolu) and TR51 (Ankara). This cluster is accounted by the industrial axis and its spillover effects on TR21 (Edirne, Kırklareli, Tekirdağ) and TR41 (Bursa, Bilecik, Eskişehir). It is a right-skewed distribution. The number of regions below the mean is 15 while the number is 11 above the mean.

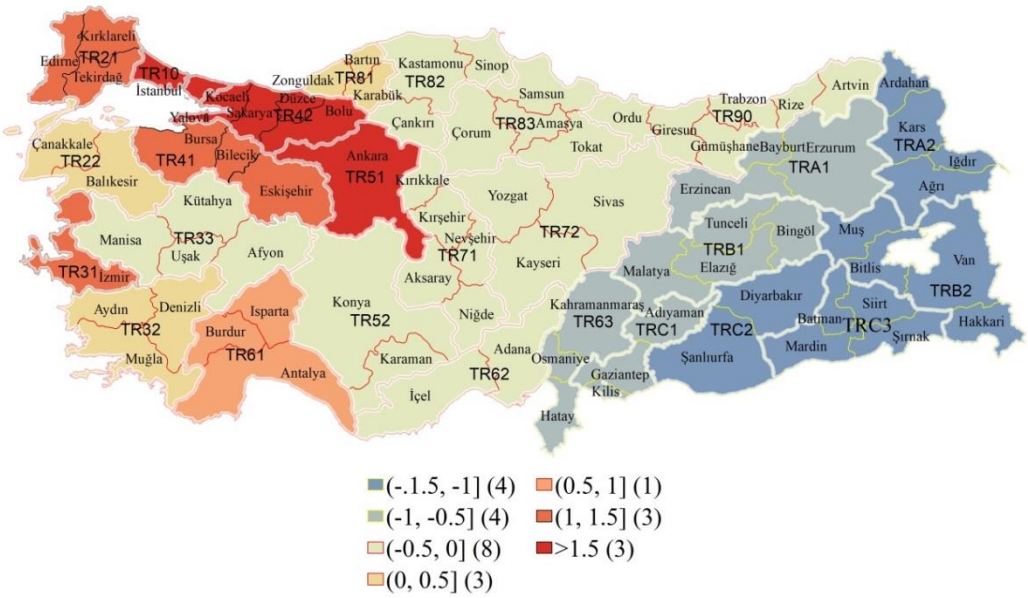

Figure 5.15. Per capita Gross Value Added at regional level in 2004.

The Figures 5.15 and 5.16 are similar except TRB2 region (Muş, Bitlis, Van, Hakkari) with a decrease and TR33 (Manisa, Uşak, Kütahya, Afyon) with an increase. TR33 separately has higher than the average per capita GVA in 2011.

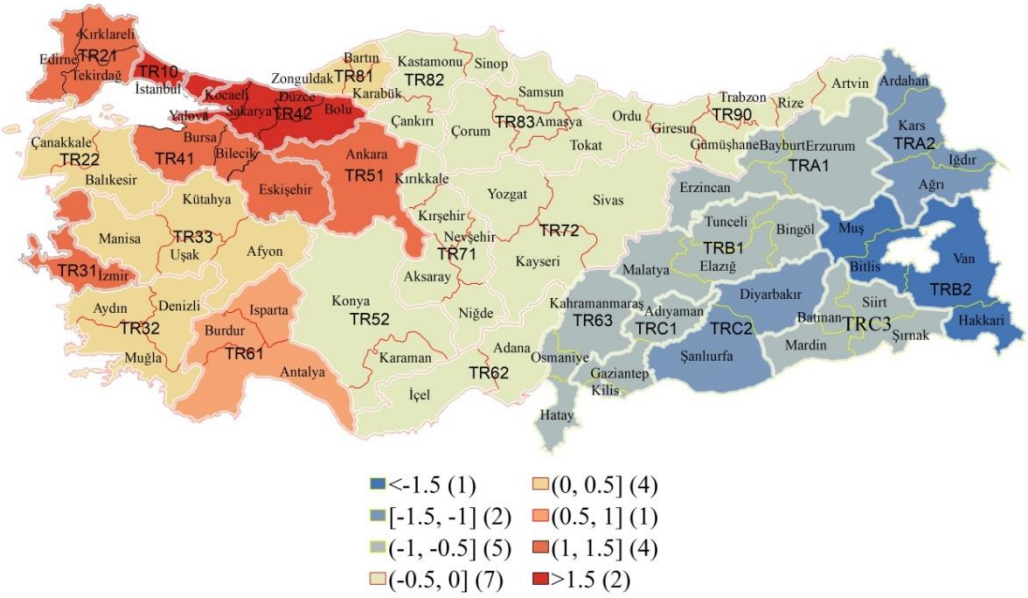

Figure 5.16. Per capita Gross Value Added at regional level in 2011.

In Figure 5.15, two clusters one as TR31, TR32, TR61 (west-southwest axis on the coastal band) and the other one as TR21, TR10, TR42, TR41, TR51 (northwest-

southeast directional axis from Edirne to Ankara) come to the forefront. On the contrary, two clusters in the east appear in terms of lower per capita GVA. TR63, TRC1, TRC2, TRB1, TRA1 as one cluster, and TRC2, TRB2, TRA2 as another cluster have kept their positions below the national average between 2004 and 2011.

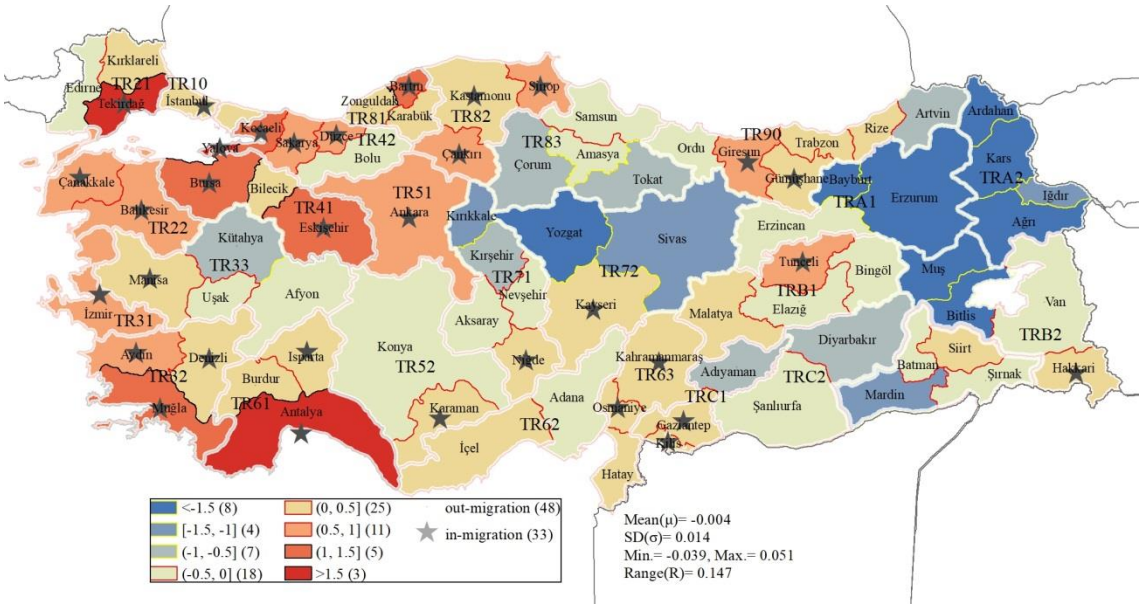

Figure 5.17. Net Migration Rate at provincial level in 2008.

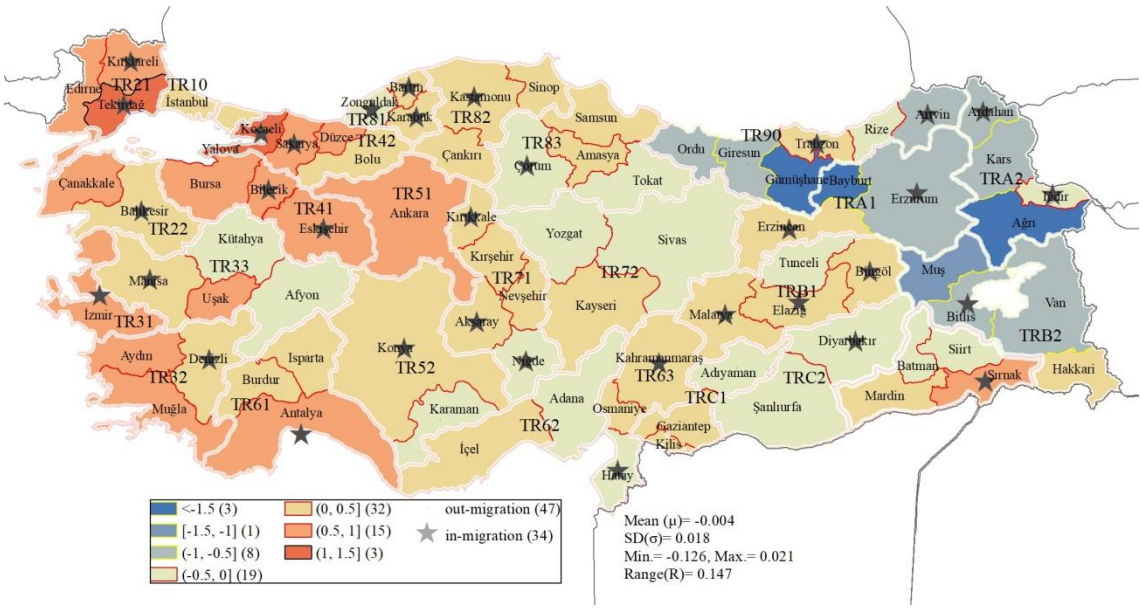

Figure 5.18. Net Migration Rate at provincial level in 2017.

The Figures 5.17 and 5.18, in contrast to Figures 5.15, 5.16 show the cities whether receiving migration or not. The symbol of star represents the cities receiving

migration. According to Figure 5.17, the net migration rate is a right-skewed distribution. The median value is lower than the mean; the median city is Bilecik with the value of -0.0007. Eleven cities which are Kırklareli, Bilecik, Zonguldak, Karabük, Burdur, İçel, Hatay, Malatya, Trabzon, Rize, Siirt have less out-migration than the national average.

The distribution of net migration rate in 2017 differs from the initial distribution (Figure 5.17). The number of cities with negative net migration rate almost is hold; however the variety of the cities that out-migrate (in-migrate) changes. Compared to 2008, cities; Aksaray, Amasya, Ardahan, Artvin, Batman, Bayburt, Bilecik, Bingöl, Bitlis, Bolu, Burdur, Çorum, Diyarbakır, Edirne, Elazığ, Erzincan, Erzurum, Hatay, Iğdır, İçel, Karabük, Kars, Kırıkkale, Kırklareli, Kırşehir, Konya, Kütahya, Malatya, Mardin, Muş, Nevşehir, Ordu, Rize, Samsun, Siirt, Sivas, Şanlıurfa, Şırnak, Tokat, Trabzon, Uşak, Van, Yozgat, Zonguldak become in-migration cities in 2017. In regions TRA1, TRA2, TR72, TRC2, TRC3, an upturn occurs.

The components of net migration in terms of age accompany. The features under the age category are child (0-14), student (15-24), younger adult (25-44), older adult (45-64), senior (65+).

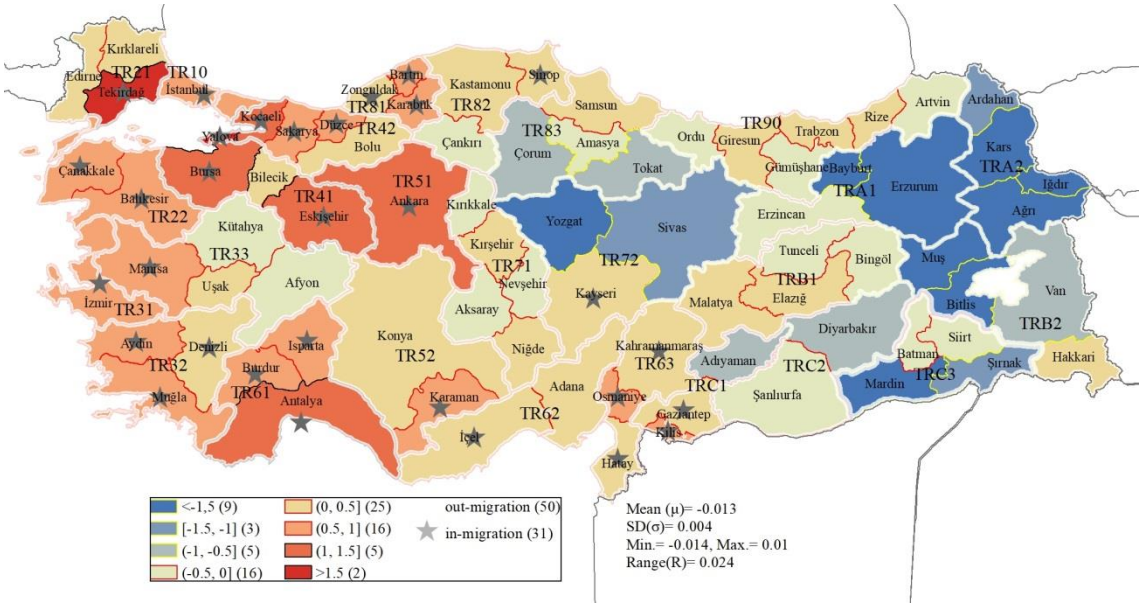

Figure 5.19 Child Net Migration Rate at provincial level in 2008.

Based on Figure 5.19, the child net migration in 2008 is agglomerated in the western coastal band and in the hinterland of Bursa, İstanbul and Ankara. Yalova (0.01),

Tekirdağ (0.007), Antalya (0.004), Bursa (0.0039) and Kocaeli (0.0036) have higher child net migration rate. The numbers in parentheses are the rates of child net migration. The greater amount of child in-migration belong to İstanbul (41302), Ankara (18543), İzmir (12890), Antalya (10361) and Bursa (9576). The numbers in parentheses are the numbers of people to immigrate. Ranking of the quantities and rates of migration differs due to the population weights of provinces.

In Figure 5.19, the cities Muş, Ağrı, Mardin, Yozgat and Erzurum lose away child population at the highest rate, respectively. There are additionally seventeen cities that outmigrate but they are above the national average of child net migration rate. The lowest child net migration rate pertain to Bayburt(-0.026), Gümüşhane (-0.013), Ağrı (-0.011), Muş (-0.007), Kars (-0.006) while the higher child net migration rate belong to Tekirdağ (0.006), Yalova (0.005), Kocaeli (0.004), Eskişehir (0,003), Bursa (0.002). The shape of distribution is right-skewed where the median value (-0.0007) of Bilecik is lower than the national mean (-0.013).

In Figure 5.20, the distribution of child net migration rate is also right-skewed. Furthermore, thirteen cities are out-migrating however are above the national mean.

Compared of Figure 5.20 with Figure 5.19, it is stated that there is a relative betterment in Northern and Middle Eastern Anatolian regions, and TR72.Importantly, the distribution reaches to a balance, compared to Figure 5.19 because the number of out-migration in 2008 decreases to 39 cities in 2017.

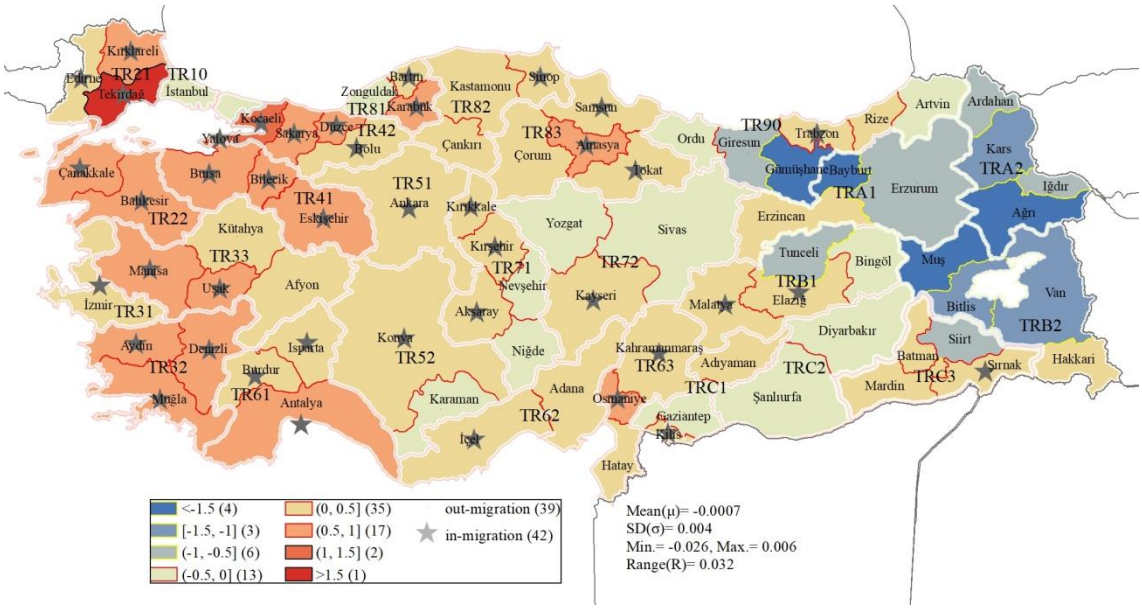

Figure 5.20. Child Net Migration Rate at provincial level in 2017.

The net migration rate of student population is defined between 15-24 ages. The next two Figures show the distribution of student net migration rates indicating particular provinces.

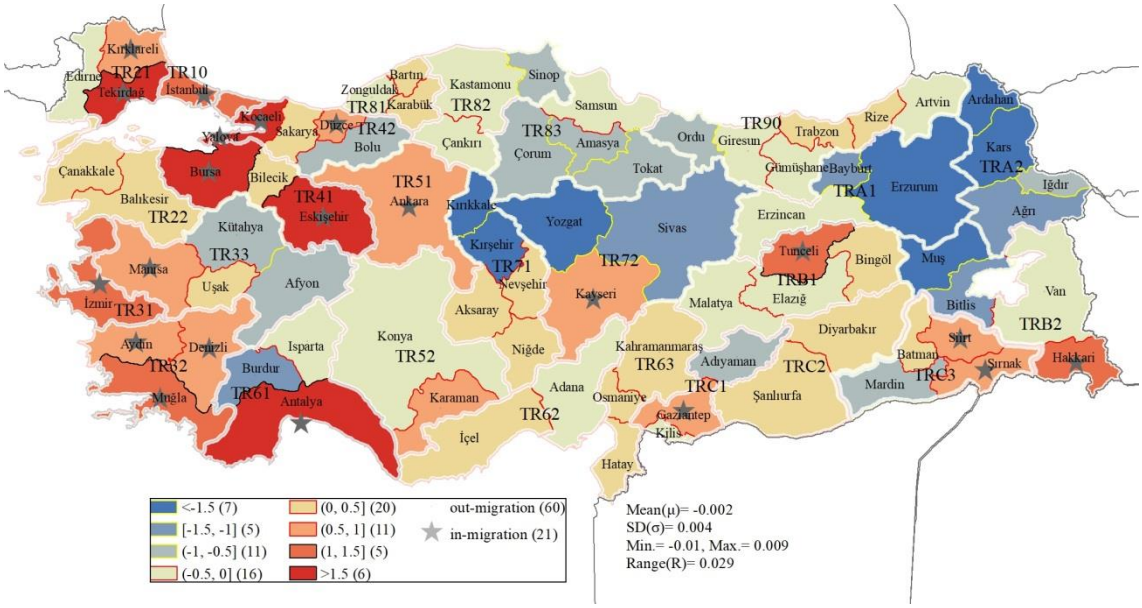

Figure 5.21. Student Net Migration Rate at provincial level in 2008

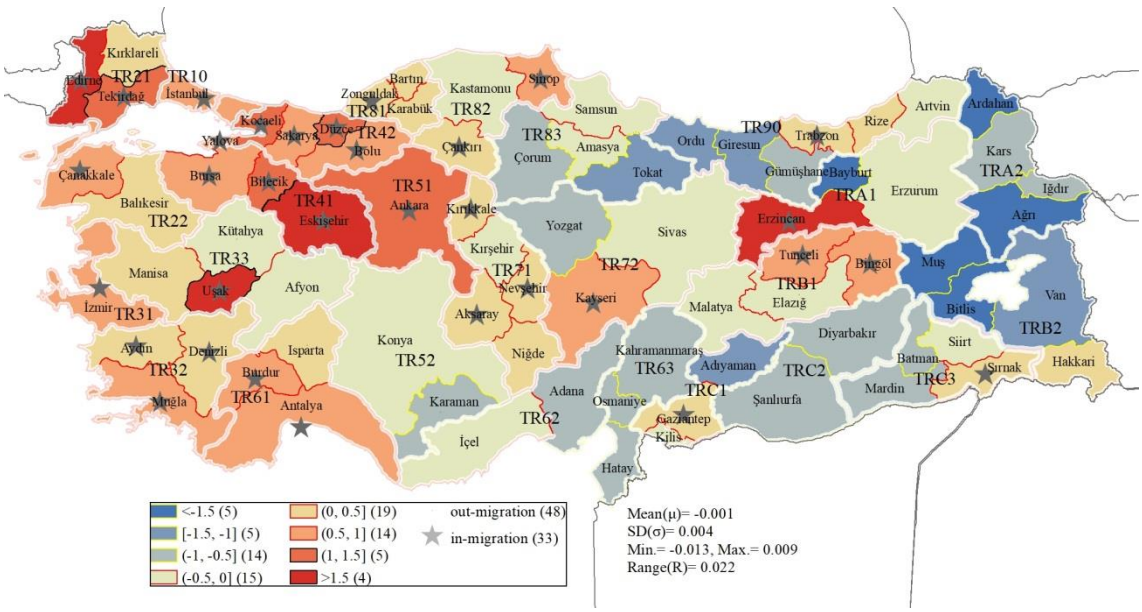

Figure 5.22. Student Net Migration Rate at provincial level in 2017.

Based on the Figure 5.21, Muş (-0.01), Yozgat (-0.009), Erzurum (-0.009), Kırıkkale (-0.009) and Kars (-0.008) have the lowest student net migration rate. The highest rates belong to the cities of Yalova (0.009), Tekirdağ (0.0088), Antalya (0.005),

Bursa (0.005) and Kocaeli (0.005). There are twentyone cities that emigrate but are higher than the national mean.

The Figure 5.22 shows that there are five in-migration clusters that are higher student net migration rates. The clusters are located in Eastern Marmara (TR4) and Ankara, Western Marmara (TR2) and İstanbul, Aegean regions and TRA1 (Erzincan) and TRB1 (Tunceli, Bingöl) regions and Middle Anatolian (TR7) regions.

The existence of university may lead the cities much attractive for this age group. Tekirdağ, Uşak, Eskişehir and Erzincan become the highest in-migrating cities in terms of student age. The cities have the capacity of undergraduate student 30589, 28606, 26106, 72269, 20537, respectively.[135] Significantly, Sinop, Trabzon, Şırnak, Gaziantep that are in-migrating cities become individual nodes for student population contain 9698 (one university), 56199 (two universities), 2390 (one university), and 49965 (three universities) student capacities, respectively. Based on the Figure 5.22, Kırklareli, Manisa, Bilecik, Siirt, Hakkari become out-migration cities while Sakarya, Bolu, Zonguldak, Sinop, Uşak, Burdur, Aksaray, Nevşehir, Kırıkkale, Çankırı, Bingöl, Erzincan, Trabzon become in-migration cities. The Eastern Marmara region, the western coastal band from Izmir to Antalya, and the cluster of Erzincan, Tunceli, Bingöl consolidate.

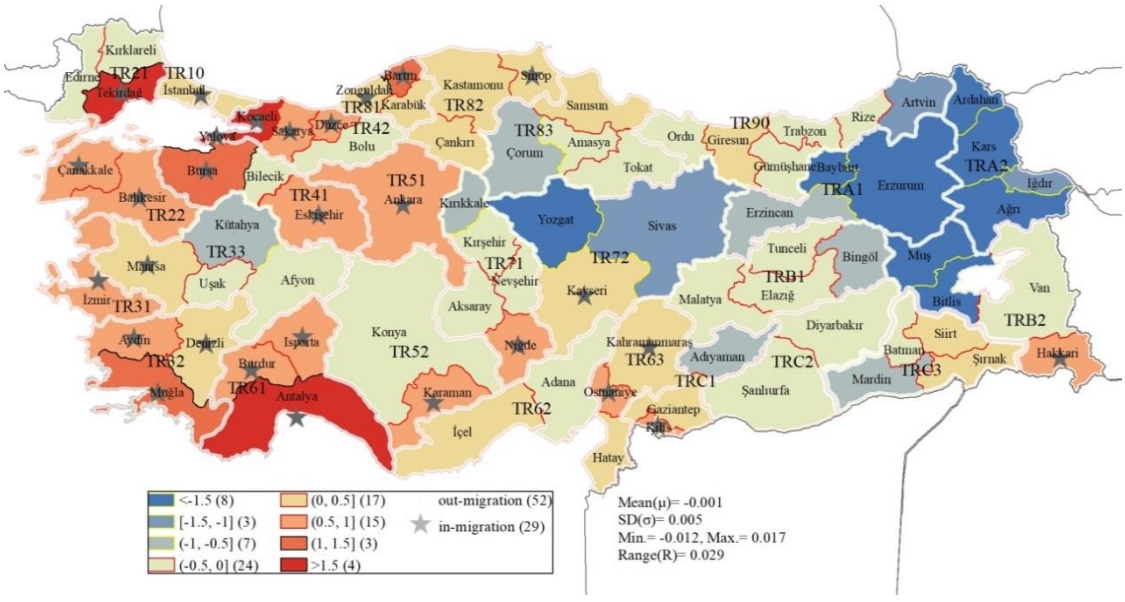

Figure 5.23. Younger Adult Net Migration Rate at provincial level in 2008.

[135] The student numbers were obtained from the official website of Council of Higher Education https://istatistik.yok.gov.tr/, under the section of student statistics, in 1.6.2018.

Based on Figure 5.23, Muş (-0.012), Bayburt (-0.011), Erzurum (-0.011), Kars (-0.01),Yozgat (-0.01) have the lowest younger adult net migration rates while Yalova (0.019), Tekirdağ (0.011), Antalya (0.008), Kocaeli (0.006) and Muğla (0.005) have the highest rates.

There are a negative cluster in Bayburt with its surrounded cities and a greater cluster comprising TRA1, TRA2 and TRB2 in the Northeastern and Eastern Anatolian regions. Furthermore, Kütahya, Uşak and Afyon is an out-migartion region except Manisa.

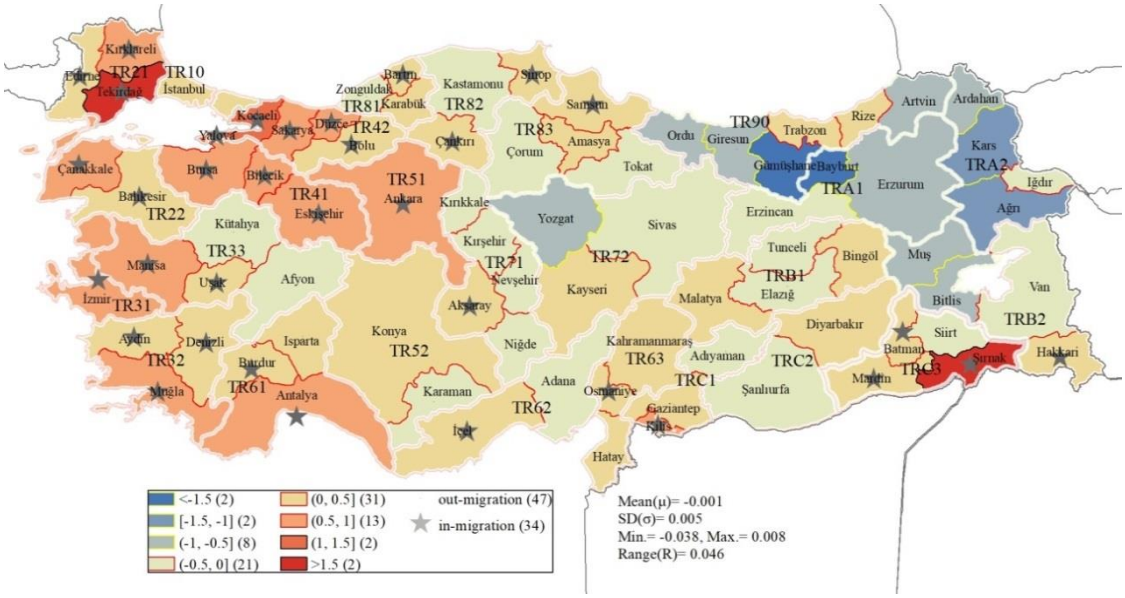

Figure 5.24. Younger Adult Net Migration Rate at provincial level in 2017.

TR22, TR31 and TR32 in Aegean region, TR61 in Mediterranean region, the northwestern coastal band from Kocaeli to Bartın, and all the cities having coastal line of Marmara Sea are the in-migration clusters. In addition, Eskişehir and Ankara are in-migration cities particularly. On the other hand, Hakkari surprisingly is an in-migrating city particularly within its regions, similar to Tekirdağ, Sinop, Kayseri, Niğde, Karaman and Kilis. With the comparison of Figures 5.23 and 5.24, it is stated that the distribution becomes much balanced. In Figure 5.24, TR21, TR22, TR31, TR32, TR61 except Isparta, TR42, TR51 and TRC3 except Siirt are in-migration regional clusters. Remarkably, Şırnak (from -0.0008 to 0.007), Mardin (from -0.004 to 0.0007) and Batman (from -0.002 to 0.0006) become in-migration cities compared to 2008. Tekirdağ keeps its position with the highest younger adult net migration rate (0.011 in 2008, and 0.008 in 2017).

Additionally, Edirne, Kırklareli, Uşak, Aksaray, Çankırı, İçel and Samsun also become in-migration cities.

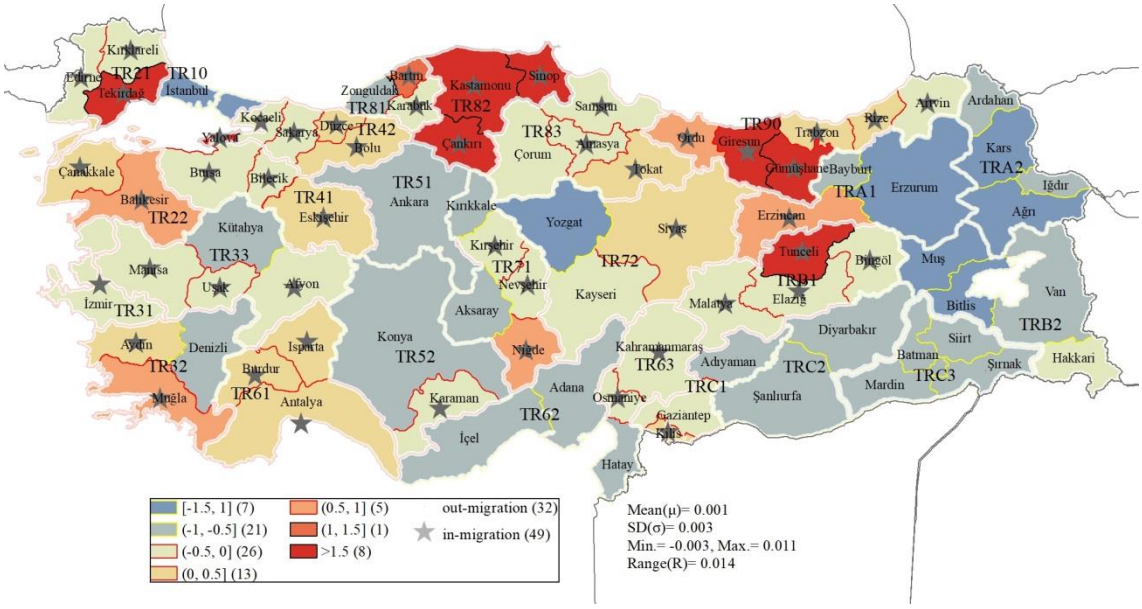

Figure 5.25. Older Adult Net Migration Rate at provincial level in 2008.

Based on Figure 5.25, there emerge new clusters, compared to previous features. TR82, TR90 and TRB1 and TR21 are the outstanding regions in terms of odler adult net migration. 49 cities are in-migration cities that are nearly distributed in each region except TRA2, TRB2, TRC3, TRC2. Surprisingly, from the metropolitan cities İstanbul, Ankara, Adana, İçel, Hatay, Diyarbakır, Van, Denizli older adult population immigrate. Beside this, Gaziantep (-0.00009), Kayseri (-0.00008), Hakkari (-0.00002) and Çorum (-0.00001) are the cities that are out-migration however are above the national rate.

In Figure 5.26, cities more than the half of the country receive older adult migration. The outstanding cities are Gümüşhane, Bayburt and Giresun that are considerably lower than the national mean.

Surprisingly İstanbul, Adana, Diyarbakır, Van, Gaziantep lose older adult migration.[136] There is a broader cluster (TRA1, TRA2, TRB2, TRC3 except Şırnak) that are out-migration cities. TRB1, TR32, TR31, TR22, TR41, TR21, TR83 are in-migration region. Kütahya, Afyon, Isparta, Nevşehir, İçel, Hatay, Şanlıurfa, Mardin, Batman, Erzincan, Ardahan are the cities that are out-migration however are above the national rate. In general, based on Figure 5.27, İstanbul (-0.0007), Ankara (-0.0003),

[136] The study of "Rankings and index values of well-being index for provinces" done in 2015 determines İstanbul in the 50th, Adana in the 70th, Diyarbakır in the 79th, Van in the 49th, Gaziantep in the 54th rank.

Kars (-0.0003), Kütahya (-0.0003), Adana (0.00024) have the lowest senior net migration rates while Gümüşhane (0.0033), Yalova (0.0031), Çankırı (0.0029), Tunceli (0.0024), Giresun (0.0016) have the highest senior net migration rates.

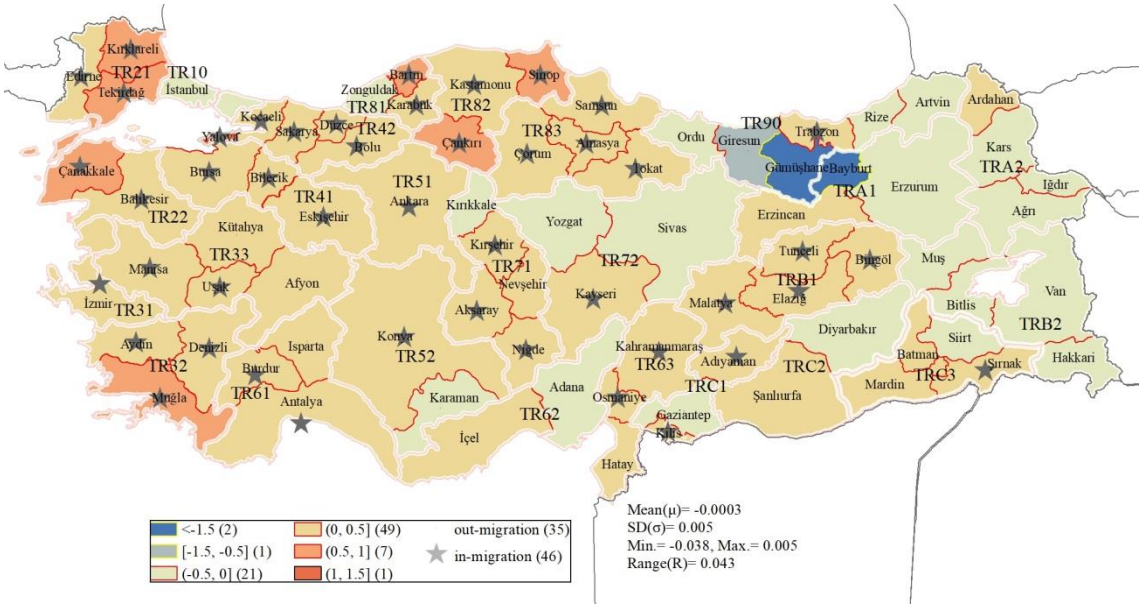

Figure 5.26. Older Adult Net Migration Rate at provincial level in 2017.

According to the Figure 5.27, there are two outstanding clusters emerged. One is the cluster of Giresun, Gümüşhane, Erzincan and Tunceli that has spillover effect on its surrounded cities that are Ordu, Trabzon, Bayburt, Sivas, Malatya, Elazığ, Bingöl. It is absolutely a stronger cluster at the intersection of the Eastern Blacksea, the Middle Anatolian and Middle Eastern regions. TRC3 also is a senior in-migration region. The other cluster is the TR82 region comprising Çankırı, Kastamonu and Sinop.

Furthermore, TR42 region entirely is senior in-migration region, similar to TR22, TR32, TR61, TR90 and TR71 except Aksaray, TR83 except Çorum, and TRC1 except Gaziantep. Importantly it is stated that İstanbul, Ankara, Konya, Adana, İçel, Şanlıurfa, Diyarbakır, Erzurum, and Van are the metropolitan cities that out-migrate senior population. On the contrary, İzmir and Denizli are in-migration cities however; they are below the national mean.

Figure 5.28 shows a much-balanced distribution compared to the pervios one (Figure 5.27). In general, Bayburt (-0.011), Gümüşhane (-0.004), Sivas (-0.0035), Giresun (-0.0032), Artvin (0.0032) have the lowest senior net migration rates, respectively while Yalova (0.0018), Kocaeli (0.00079), Tekirdağ (0.00078), Kırklareli

(0.00059), Ankara (0.0005) have the highest senior net migration rates. Additionally, Kütahya, Afyon, Isparta, Konya, Karaman, Aksaray, Kırşehir, Niğde, Adana, Kahramanaraş, Gaziantep, Kilis, Adıyaman, Şanlıurfa, Diyarbakır, Malatya, Elazığ, Bingöl, Bitlis, Muş, Bitlis, Siirt, Şırnak, Hakkari, Van, Iğdır, Karabük, Zonguldak, Bolu, Amasya are the cities above the national mean but they are out-migration cities.

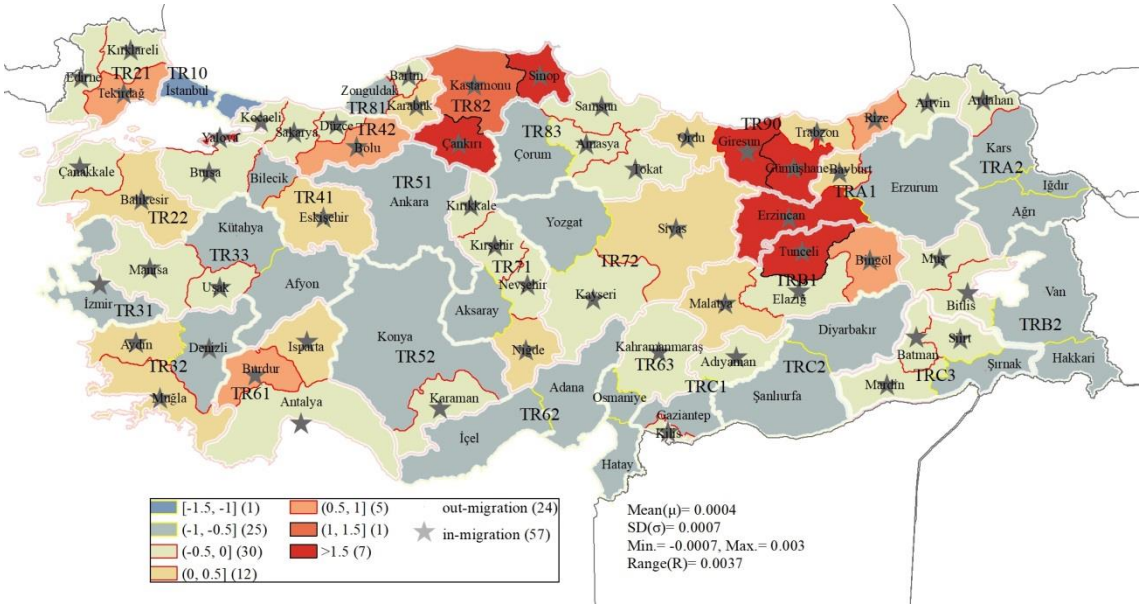

Figure 5.27. Senior Net Migration Rate at provincial level in 2008.

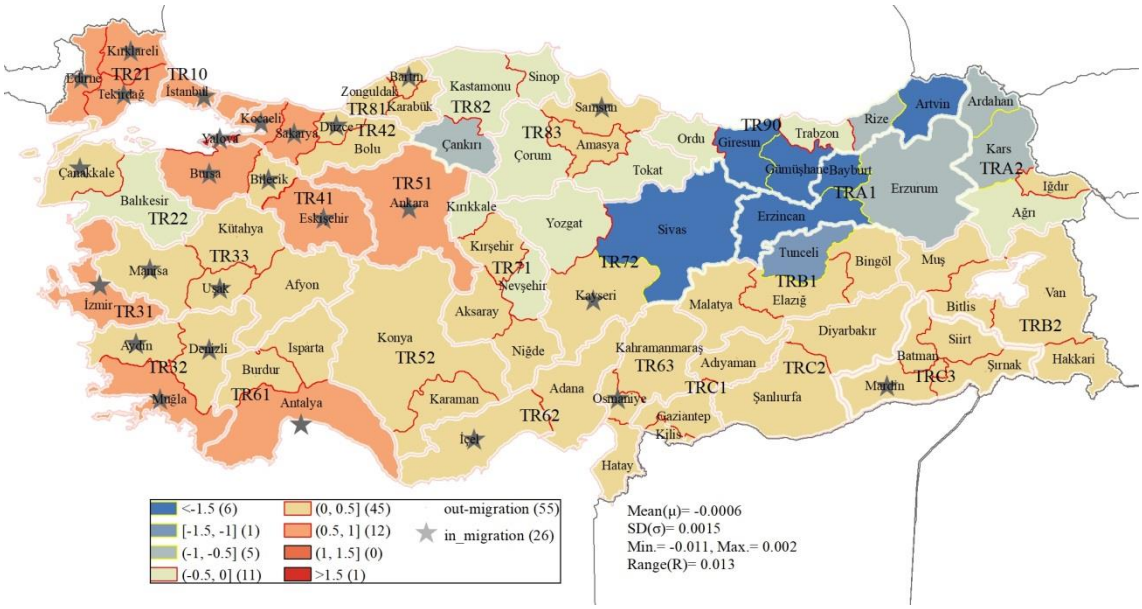

Figure 5.28. Senior Net Migration Rate at provincial level in 2017.

Compared to 5.27, in Figure 5.28 the stronger cluster at the intersection of the Eastern Blacksea, the Middle Anatolian and Middle Eastern regions transform into out-migration cluster whose surrounding cities identically are out-migration cities. The northwest-southeast axis from Western Marmara including İstanbul, TR42, TR41 and Ankara is an in-migration cluster. The other cluster is the western coastal band from İzmir to the direction of İçel by passing Aydın, Muğla and Antalya.

When explaining Figure 5.29, Yalova (0.024), Tekirdağ (0.016), Antalya (0.01), Kocaeli (0.008), Bursa (0.007) have the highest female net migration rates. On the other hand, Muş (-0.02), Yozgat (-0.016), Erzurum (-0.016), Bayburt (-0.014), Kars (0.014) have the lowest female net migration rates. The numbers in parentheses are female net migration rates.The national female net migration rate is negative which means that cities generally out-migrate female population. Regions TRA1, TRA2, TRC2 and TR83 totally include out-migrate cities. On the contrary, TR21, İstanbul, Ankara, TR41, İzmir, TR32, TR61, TR63, TR82 as entire regions; TR42 except Bolu, TRC1 except Adıyaman and TR90 except Artvin have female in-migration.

For a further evaluation Karaman contrarily Konya in its region, İçel contrarily Adana, Manisa contrarily Kütahya, Uşak, Afyon, Siirt in TRC3, Hakkari in TRB2, Tunceli in TRB1 particularly are in-migration cities. It could be discussed that the so-called cities may be regional nodes for the female immigration.

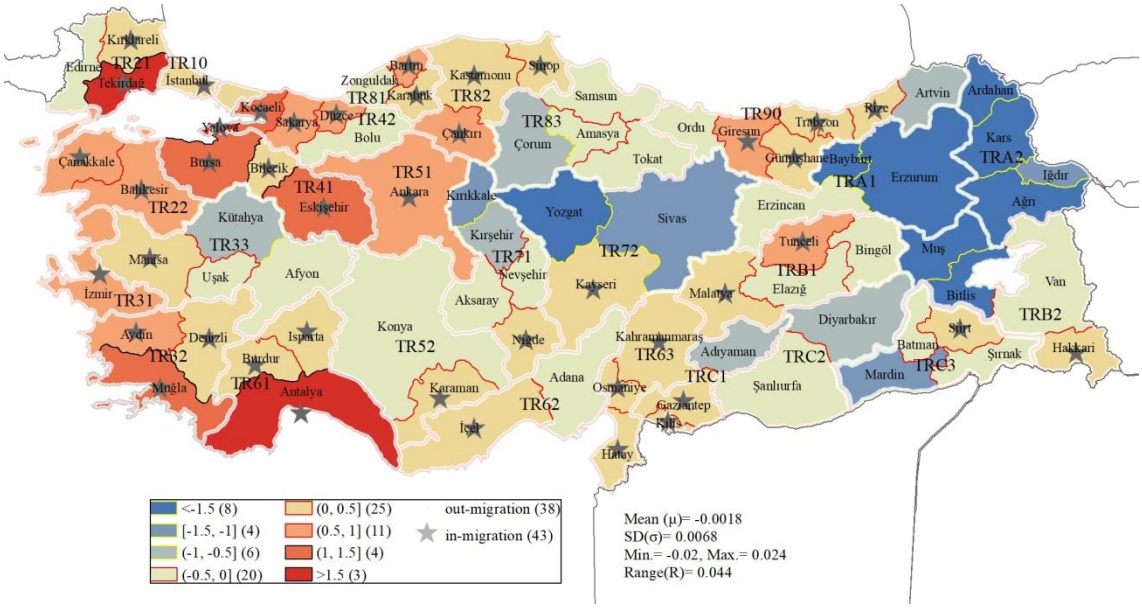

Figure 5.29. Female Net Migration Rate in 2008.

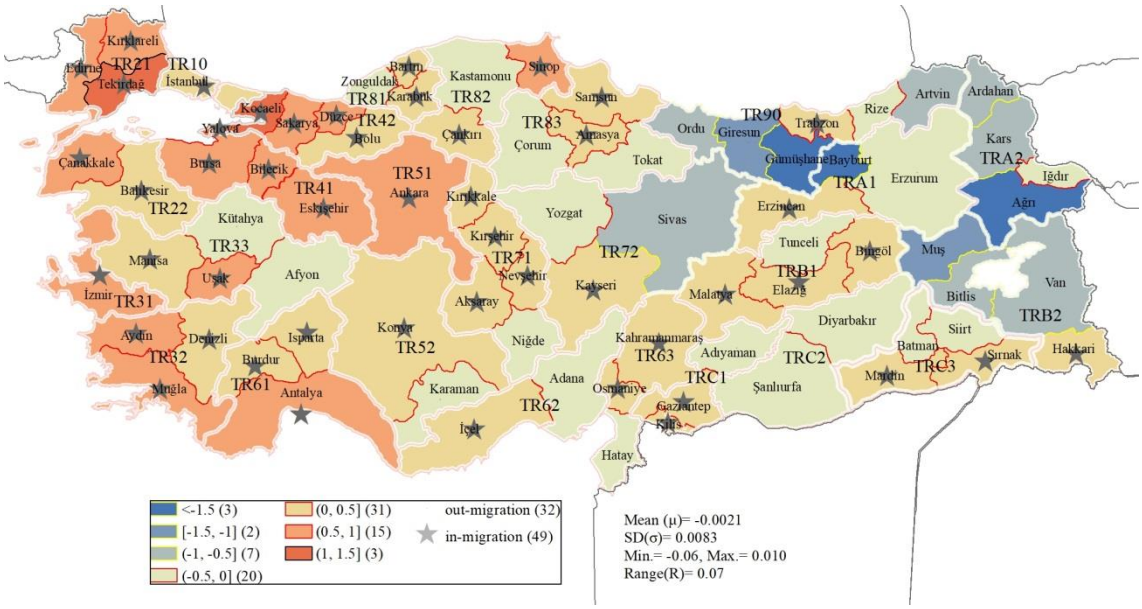

Figure 5.30. Female Net Migration Rate in 2017.

Based on Figure 5.30, Bayburt (-0.06), Gümüşhane (-0.02), Ağrı (-0.016), Muş (-0.012), Giresun (-0.012) are the lowest female net migration rates in 2017 while Tekirdağ (0.010), Yalova (0.001), Kocaeli (0.007), Eskişehir (0.006), Edirne (0.006) are the highest female net migration rates. All the cities receiving female migration are above the national mean. The median value (-0.001) belongs to Kilis which is higher than the national mean. Accordingly, Figure 5.30 shows a left-skewed distribution.

There are 33 cities receiving male migration. Kırklareli, Bilecik, Burdur, İçel, Hatay, Aksaray, Karabük, Zonguldak, Erzincan, Trabzon, Rize, Siirt are below the national mean however they are out-migration cities. Rize corresponds to median value with -0.0013. This distribution is also a left-skewed where the median value is higher than the mean value. Muş (-0.02), Erzurum (-0.016), Bitlis (-0.016), Ağrı (-0.015), Kars (-0.014) are the lowest male net migration rates while Yalova (0.027), Tekirdağ (0.017), Antalya (0.01), Kocaeli (0.008), Eskişehir (0.007) are the highest male net migration rates, respectively. İstanbul, Isparta, Konya, Kırşehir, Karaman, İçel, Kastamonu, Amasya, Rize, Malatya, Elazığ, Bingöl, Malatya, Kahramanmaraş, Mardin are above the national mean but they are out-migration cities.

Bayburt (-0.07), Gümüşhane (-0.03), Ağrı (-0.016), Muş (-0.011), Bitlis (-0.01) have lowest male net migration rates while Tekirdağ (0.01), Yalova (0.010), Bilecik (0.008), Şırnak (0.008), Kocaeli (0.007) have the highest net migration rates. While Tekirdağ and Kocaeli are industrial nodes, Yalova and Bilecik are within the spillover

effects of Kocaeli and Bursa-Eskişehir axis, respectively. Surprisingly, Şırnak is particularly an in-migration city, like Hakkari. Kilis, Osmaniye, Aksaray, Sinop and Çankırı, Samsun, Trabzon, Erzincan, Kayseri, Manisa and Uşak are the cities that are particular or pairwise cities in their regions.

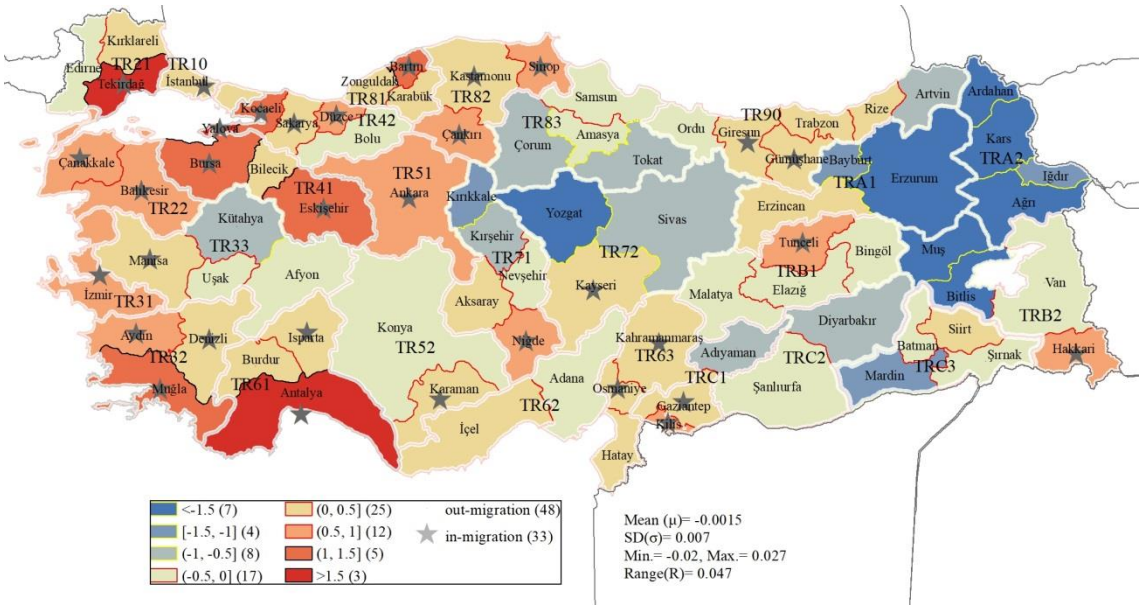

Figure 5.31. Male Net Migration Rate in 2008.

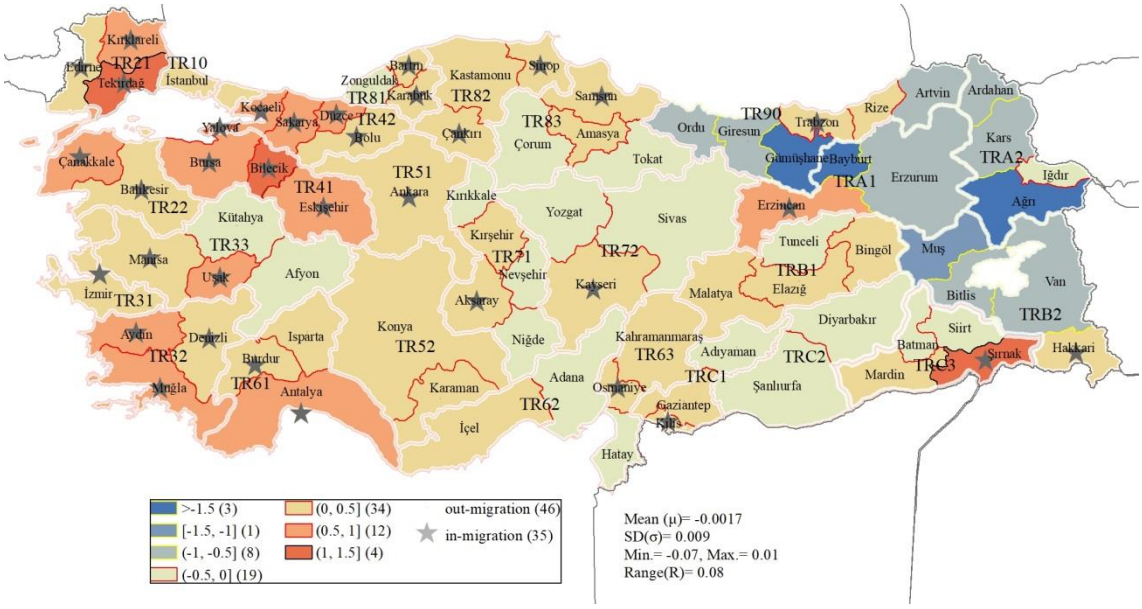

Figure 5.32. Male Net Migration Rate in 2017.

Comparing with Figure 5.31, Figure 5.32 shows a much-balanced distribution.

The median value pertains to Isparta (-0.0005) is higher than the national mean. In other words, the Figure 5.32 shows a left-skewed distribution.

In Figure 5.32, Uşak, Denizli, Bilecik, Kastamonu, Kırıkkale, Amasya, Artvin, Erzincan, Elazığ, Hatay, Konya are the cities above the national mean however are still out-migration cities. Mardin (-0.013), Muş (-0.011), Ardahan (-0.01), Kars (-0.009), Bayburt (-0.008) are the lowest low-educated net migration rates while Çankırı (0.025), Trabzon (0.006), Tekirdağ (0.0045), Batman (0.004), Bolu (0.0036) are the highest low-educated net migration rates.

For a further evaluation, it is said that Trabzon, Batman, Gaziantep, Bartın and Kayseri may be nodes for employment of low-educated population. There are also region-based clusters that receive low-educated migration that are TR21, TR22, TR42, TR41 except Bilecik, TR51 (Ankara), TR31 (İzmir), TR32 except Denizli, TR61, TR62 and TR83 except Çorum.

On the other hand; Çorum, Yozgat, Kırşehir, Sivas have lower low-educated net migration rate compared to surrounded cities. Furthermore, TRA2, TRA1, TRB2, and partially TRB1 generate another greater cluster that emigrate low-educated population.

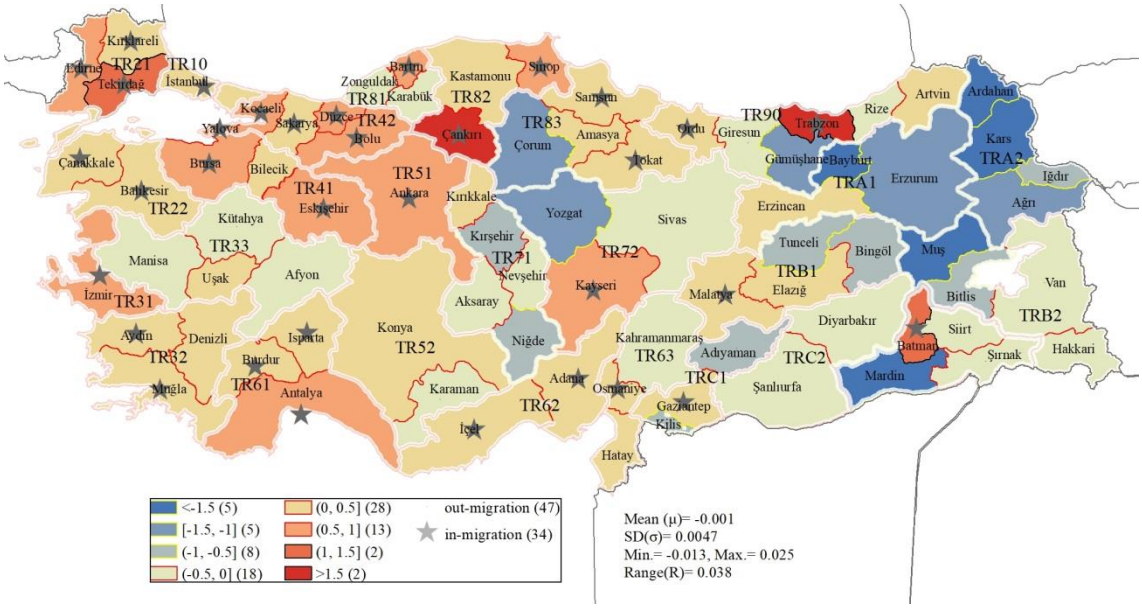

Figure 5.33. Low-Educated Net Migration Rate in 2009.

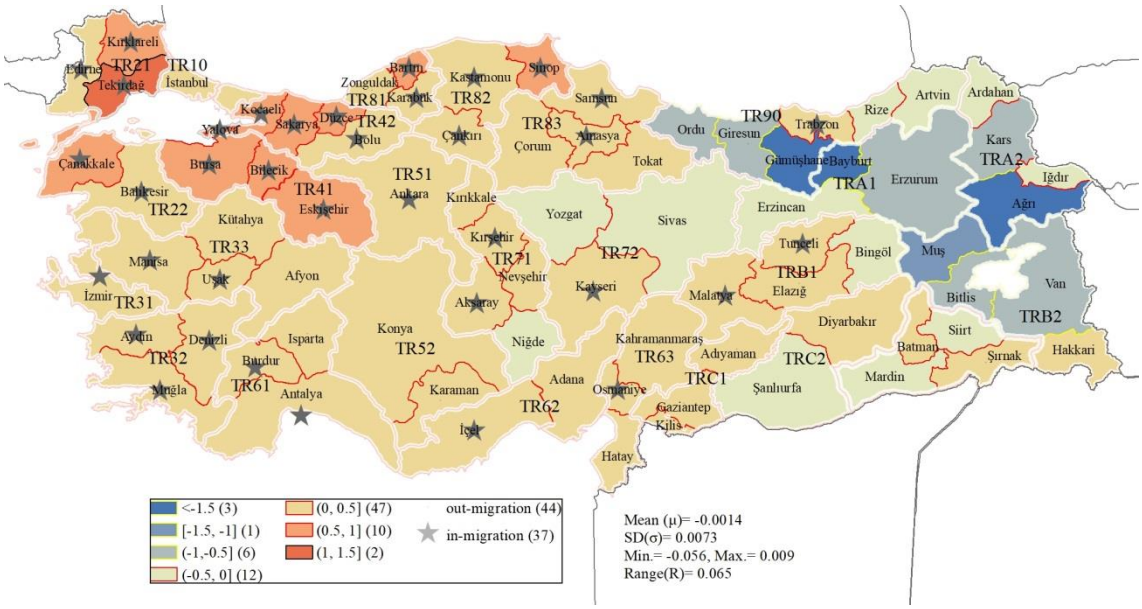

Figure 5.34. Low-Educated Net Migration Rate in 2017.

According to Figure 5.34, it is stated that İstanbul, Kütahya, Afyon, Isparta, Zonguldak, Çorum, Tokat, Kırıkkale, Nevşehir, Konya, Karaman, Adana, Hatay, Kahramanmaraş, Gaziantep, Kilis, Adıyaman, Diyarbakır, Elazığ, Batman, Şırnak, Hakkari are above the national mean however are out-migration cities in terms of low-educated population in 2017. To express the tails, Bayburt (-0.056), Gümüşhane (0.02), Ağrı (-0.013), Muş (-0.01), Kars (-0.008) are lowest low-educated net migration rates while Tekirdağ (0.009), Yalova (0.007), Kocaeli (0.006), Kırklareli (0.003), Bartın (0.003) are the highest low-educated net migration rates. Figure 5.34 shows a much-balanced distribution that is left-skewed. The median value is (-0.00008) of Konya that is higher than the mean.

For a further evaluation, it could be discerned almost two great clusters across the country. The western part of Middle Anatolian Region (TR7) includes almost in-migration cities while the eastern part of the region is specified by out-migration cities.

Based on Figure 5.35, Bursa, Uşak, Aydın are above the national mean but are out-migration cities. Tunceli (-0.010), Mardin (-0.007), Ardahan (-0.007), Hakkari (-0.006), Iğdır (-0.005) are the lowest middle-educated net migration rates while Çankırı (0.011), Isparta (0.01), Eskişehir (0.0091), Erzincan (0.0083), Bolu (0.0077) have highest middle-educated net migration rates.

To mention of cluster emerged in terms of middle-educational attainment, beside the longer industrial axis uniting TR21 with TR51 (Ankara), Eskişehir may extend to Bilecik. Kütahya and Afyon may be affected by the industrial nodes of Eskişehir and

Denizli. Niğde may be affected by TR52 (Konya and Karaman). Furthermore, TRA1 becomes a stronger node for middle-educated net migration. Gümüşhane and Trabzon have higher rate than the other cities within their regions. Sivas comes to the fore within its region. In TR71, Kırıkkale, Kırşehir and Niğde have higher rates compared to the rest within the region.

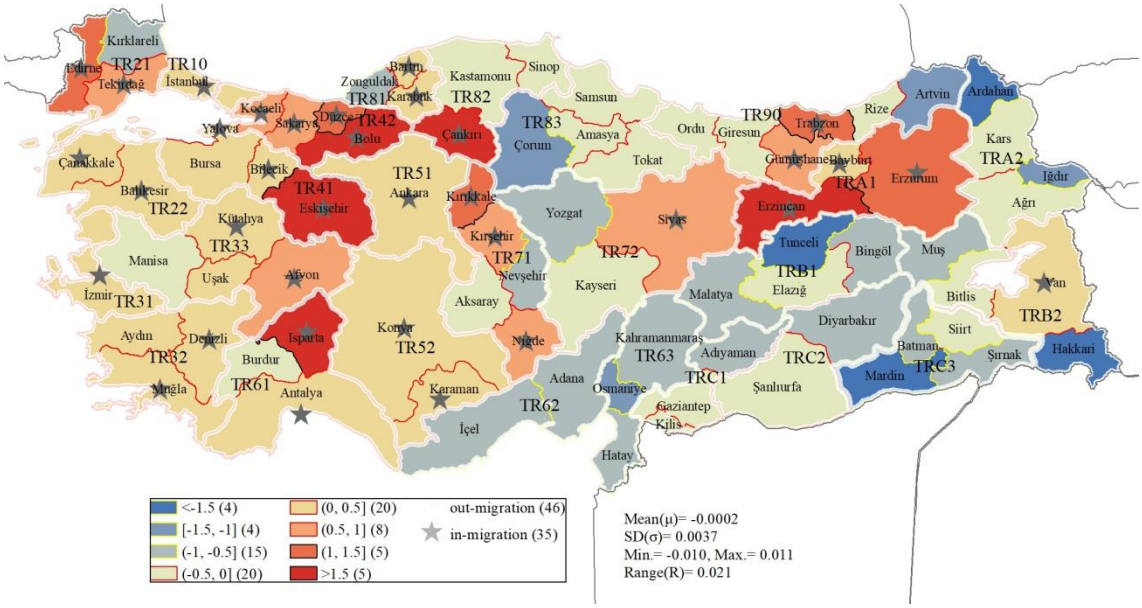

Figure 5.35. Middle-Educated Net Migration Rate in 2009.

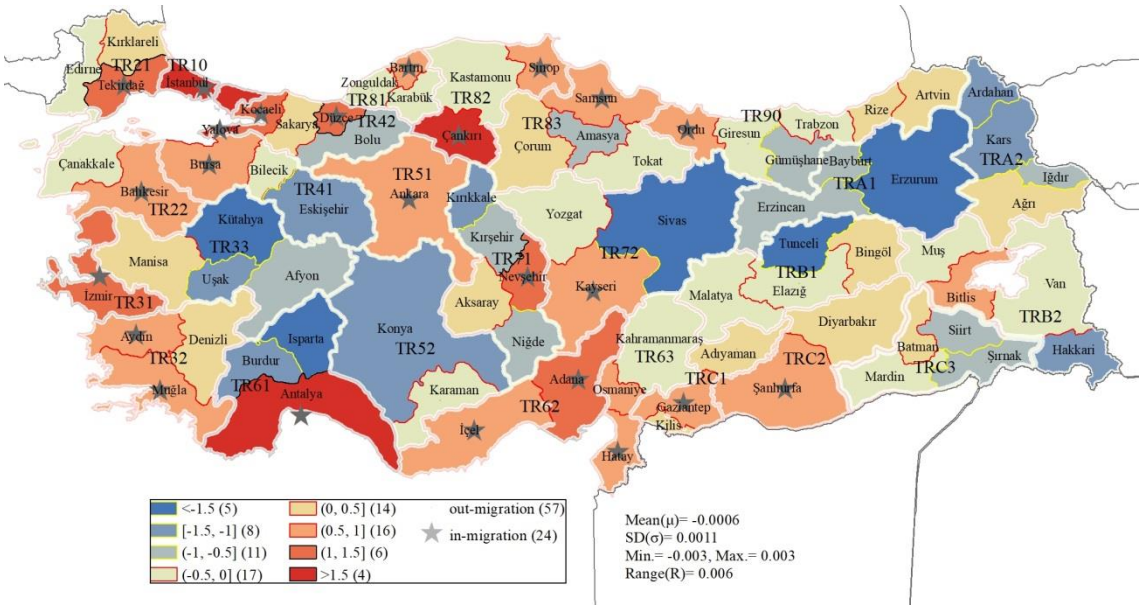

Figure 5.36. High-Educated Net Migration Rate in 2009.

As shown in Figure 5.36, Bayburt (-0.024), Ağrı (-0.007), Ordu (-0.006), Muş (-0.006), Ardahan (-0.0054) have the lowest middle-educated net migration rates as Erzincan (0.012), Edirne (0.0091), Uşak (0.0081), Burdur (0.0076), Eskişehir (0.0074) have highest middle-educated net migration rates. The median value in this distribution is (0.00019) Kastamonu and greater than the national mean. That is why the distribution is a left-skewed one. The number of cities that in-migrate nearly equals to out-migrate.

Based on Figure 5.37, the cities whose z scores are within (0, 0.5] entirely and Osmaniye, Bitlis are above the national mean however are out-migration cities. In general, Isparta (-0.003), Sivas (-0.003), Tunceli (-0.0025), Erzurum (-0.0025), Kütahya (0.0025) are the lowest high-educated net migration rates while Yalova (0.0028), Antalya (0.002), Çankırı (0.0019), İstanbul (0.0011), Kocaeli (0.001) have the highest high-educated net migration rates.

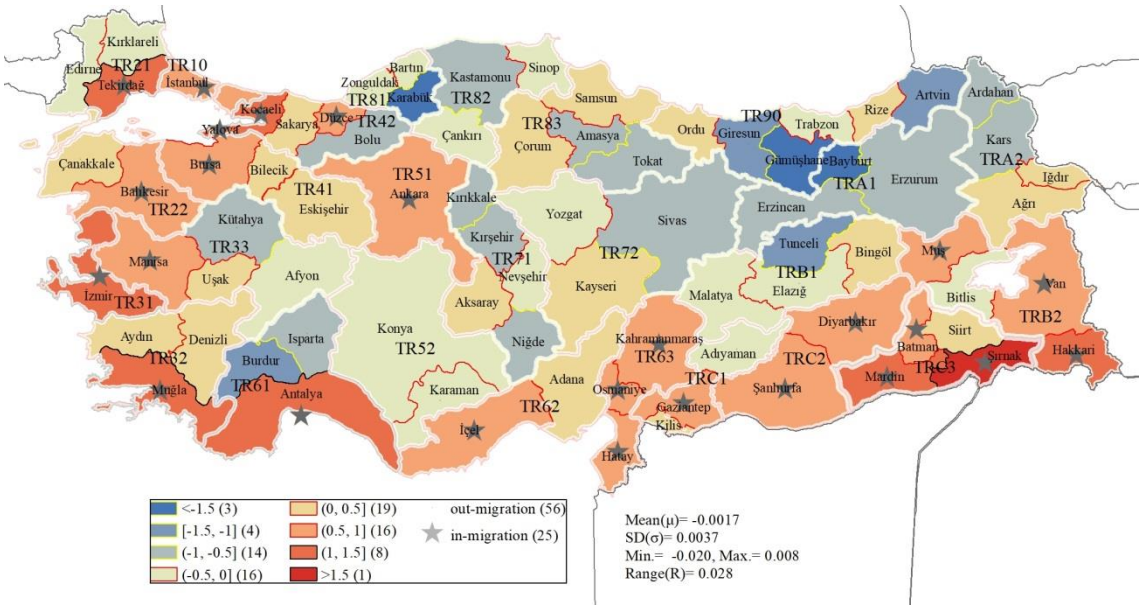

Figure 5.37. High-Educated Net Migration Rate in 2017.

For further interpretation of Figure 5.37 it is stated that two great clusters emerge in terms of lower high-educated net migration. The first cluster is surrounded by Ankara, Bursa, İzmir, Denizli, Antalya and Adana that include Kütahya, Eskişehir, Uşak, Afyon, Burdur, Isparta, Konya. Beside this, Kırıkkale, Kırşehir and Bolu may be affected by Ankara, in a negative manner.

The second cluster is a two-pronged axis; one started from the Middle Anatolian (TR7) region to TRA2 by passing TRA1. The other one emerges in TR63 extending to TRB2 by including TRB1 and TRC3.

Figure 5.38 shows that out-migration cities are greater than in-migration cities. Although cities with z-score between (0, 0.5] are above the national mean, they are out-migration cities. The distribution in the Figure 5.38 is a left-skewed distribution because the median value of-0.00108 (Uşak) is greater than the national mean (-0.0017).

Broadly, Bayburt (-0.02), Gümüşhane (-0.013), Karabük (-0.008), Artvin (-0.006), Giresun (0.006) have the lowest high-educated net migration rates while Şırnak (0.008), Muğla (0.0036), Hakkari (0.0031), Mardin (0.0025), Yalova (0.0023) have the highest high-educated net migration rates.

The coastal cities of Marmara Sea except Çanakkale, the western coastal except Aydın, and the Mediterranean coastal cities except Adana have higher High-educated net migration rates. Surprisingly, an axis appears with the inclusion of TR63, TRC1, TRB2, TRC2 and TRC3. Ankara is also a particular cluster. It is stated that Ankara may not spill over to its neighbor cities any positive effects in educational attainment.

Briefly, the illustrations between Figures 5.12 and 5.38 show that the different spatial confgurations of PCGDP and PCGVA and migration components. In the maps, some clusters have appeared while some cities have shown dissimilarities with their neighbors. That may be due to the spillover effects of some variables or some other spatial effects of the related issues.

In the wake of descriptive analyses and spatial configurations of per capita Gross Domestic Product, per capita Gross Value Added, and net migration rate and its components, the econometric analysis is needed to determine whether migration has impacts on economic growth.

The spatial configuration in this section has been generated in order to examine the regional and provincial differences and similarities in terms of a wide range of variables. These are per capita GDP, per capita GVA, growth in per capita GDP and in per capita GVA, migration grouped in ages (0-15, 15-24, 25-44, 45-64, 65+), female and male migration, low, middle, and high-educated migration.

Each variable has been configured in two maps in order to see the change in time. In addition, the maps are illustrated in provinces with showing the regional boundaries. Hence, the differences between provinces within the same region and also the differences between the neighbor regions and regional differences could be examined. The detailed examination will be given in the last section of this chapter.

5.7. Econometric Analysis

First of all, the correlation between the two pair of variables are given in Table 5.6. It shows that some variables are highly correlated with each other, however, within this knowledge the model is established on these variables.

Table 5.6. Correlation Matrix of Variables between 2009 and 2011.

	PCGVA	PCGDP	D_PCGVA	D_PCGDP	LAG_PCGVA	LAG_PCGDP	PCELEC	BACH	NMR	NMR_YOUNG	NMR_ACTIVE	NMR_SENOR	NMR_FEM	NMR_MALE	NMR_EDU	NMR_UNEDU
PCGVA	1															
PCGDP	0,97 [a]	1														
D_PCGVA	-0,08	-0,03	1													
D_PCGDP	0,00	0,04	0,89	1												
LAG_PCGVA	0,99	0,95	-0,23	-0,14	1											
LAG_PCGDP	0,96	0,98	-0,21	-0,16	0,97	1										
PCELEC	0,68	0,60	-0,07	0,02	0,68	0,59	1									
BACH	0,89	0,91	-0,06	0,06	0,88	0,89	0,56	1								
NMR	0,78	0,80	-0,16	-0,20	0,79	0,83	0,46	0,69	1							
NMR_YOUNG	0,76	0,75	-0,12	-0,17	0,76	0,78	0,66	0,66	0,87	1						
NMR_ACTIVE	0,75	0,78	-0,16	-0,20	0,75	0,81	0,37	0,67	0,99	0,78	1					
NMR_SENIOR	0,12	0,10	-0,10	-0,06	0,13	0,11	0,21	0,16	0,30	0,33	0,24	1				

(Cont. on the next page)

Table 5.6. (cont.)

	PCGVA	PCGDP	D_PCGVA	D_PCGDP	LAG_PCGVA	LAG_PCGDP	PCELEC	BACH	NMR	NMR_YOUNG	NMR_ACTIVE	NMR_SENOP	NMR_FEM	NMR_MALE	NMR_EDU	NMR_UNEDU
NMR_FEM	0,78	0,80	-0,15	-0,19	0,79	0,83	0,55	0,66	0,95	0,93	0,91	0,30	1			
NMR_MALE	0,74	0,76	-0,16	-0,19	0,74	0,79	0,38	0,68	0,98	0,78	0,99	0,28	0,87	1		
NMR_EDU	0,17	0,23	-0,12	-0,12	0,18	0,25	-0,05	0,04	0,35	0,23	0,38	-0,15	0,41	0,29	1	
NMR_UNEDU	0,76	0,76	-0,14	-0,18	0,76	0,78	0,63	0,65	0,90	0,96	0,82	0,46	0,95	0,82	0,26	1

To start with, the convergence analysis was done. To figure out the spatial autocorrelation, spatial tests for convergence were done. For each data in the dataset Moran's *I* statistics are tested. Based on this analysis, spatial tests were applied including spatial lag and spatial error tests. In pursuit of that, the association of convergence and migration was analyzed. Furthermore, to see the spatial correlation, LISA maps were illustrated for the latest year of the incomes and migration variables. Lastly, the results of the econometric analyses were discussed entirely at the end of the chapter. The convergence analysis was done according to the formula given below:

$$\text{d\_PCGDP}_{i,t} = \alpha + \beta_1 \text{PCGDP}_{i,(t-1)} + \beta_2 \text{PCELEC}_{i,t} + \beta_3 \text{BACH}_{i,t} + \sum_{i=1}^{26} \delta_i d_i + \text{pWd\_PCGDP}_{i,t} + \varepsilon_{i,t} \quad (5.5)$$

$$\varepsilon_{i,t} = \lambda W \varepsilon_{jt} \quad (5.6)$$

The Table 5.7 summarizes growth in per capita GDP and growth in per capita GVA. In the model 1, the dependent variable is the growth in PCGDP (D_ PCGDP). In the model 2, the dependent variable is the growth in PCGVA (D_ PCGVA).

In model 1, the period is between 2004 and 2014 while in Model 2, the period is between 2004 and 2011. In both models, growths in incomes are determined by the related incomes that are statistically significant, as well.

Per capita use of electricity in manufacturing have small and negative effect on growth in incomes. The bachelor rate is effective on growth in incomes. A 1% increase in bachelor rate increases the income growth with a 0.16%.

Table 5.7. Convergence Analysis with regards to growth in PCGDP and growth in PCGVA.

	D_PCGDP	D_PCGVA
	Model 1	Model 2
C(intercept)	5.97***	6.39***
LAG_PCGDP	-0.65***	
LAG_PCGVA		-0.71***
PCELEC	-0.03**.**	-0.04*
BACH	0.16***	0.16**
ρ (*rho*)	0.82***	0.81***
λ (*lambda*)	0.50*	0.45*

(Note: *** denotes significance at 1 ‰, ** 1%, * 5% and "**.**" at 10%.)

The regression results indicate clear evidence of regional income convergence because income growth has been negatively related to initial income. Moreover, spatial dependence in both regressions is evident.

In company with finding out the relations between variables, spatial analysis also becomes more of an issue. Several statistics in the Spatial Statistics toolbox of ArcGIS are used to infer spatial patterns containing Spatial Autocorrelation (Global Moran's I), Cluster and Outlier Analysis (Anselin Local Moran's *I*), and Hot Spot Analysis (Getis-Ord Gi*). Inferential statistics hinge upon probability theory. In general circumstances, probability is a measure of chance. All statistical tests depend on the probability calculations that figure out the role of chance on the outcome of any analysis. Out of these statistics, some spatial tests are used to construe the nature of the data.

For the spatial analyses, the distances between the centers of the cities are considered. In the econometric models regional scale has been used. For this reason, the spatial weight matrix is generated according to the centers of each region. Each regional center is determined as the most populated city in the region. The regional centers are given in Appendix A.

The aim of spatial test of convergence certainly is to test for endogeneity of the spatial weights matrix in a spatial autoregressive model. Among diagnostics for spatial dependence in linear models, Lagrange Multiplier (LM) test[137] comes to the fore. The hypothesis under test is expressed as one or more constraints on the values of

[137] The Lagrange Multiplier (LM) test is a general principle to test hypotheses about parameters in a likelihood framework.

parameters.[138] With the means of Lagrange Multiplier principle, several identifications for the assessment of model misspecification due to spatial dependence and spatial heterogeneity are enhanced. The nature of the measurement problems associated with data collected for aggregate spatial causes some misspecifications underlying regression analysis. The problems occur in cross-sectional and pooled space-time analyses are spatial dependence and spatial heterogeneity. Spatial dependence may be induced by different kinds of spatial spill-over effects, while heteroskedasticity could be caused by the heterogeneity inherent in the account of spatial units and from contextual variation over space.[139]

Table 5.8. Spatial Tests of Convergence Analysis.

	D_PCGDP	D_PCGVA
	Model 1	Model 2
LME Test (LM test for spatial error dependence)		
LM	325.31***	205.44***
p-value	< 2.2e-16	< 2.2e-16
LML Test (LM test for spatial lag dependence)		
LM	284.23***	168.7***
p-value	< 2.2e-16	< 2.2e-16
RLME Test (Locally robust LM test for spatial error dependence sub spatial lag)		
LM	65.66***	48.94***
p-value	5.364e-16	2.637e-12
RLML Test (Locally robust LM test for spatial lag dependence sub spatial error)		
LM	24.58***	12.21***
p-value	7.131e-07	0.0004765

(Note: *** denotes significance at 1 ‰).

As branches of LM test, foursome tests are run for two convergence models. The first one of LM test is LME testing for spatial error dependence. The second one is LML testing for spatial lag dependence. The third one is RLME that is locally robust LM test for spatial error dependence sub spatial lag. The last one is RLML Test that is locally robust LM test for spatial lag dependence sub spatial error. The results are given below. In the used LM tests, the hypotheses are:

H_0: There is no spatial autocorrelation,

H_1: There is spatial autocorrelation.

[138] Manuel Arellano, "Lagrange Multiplier Test" (2002) (retrieved from the website http://www.cemfi.es/~arellano/lmtesting.pdf, in 10.4.2018)

[139] Luc Anselin, "Lagrange Multiplier Test Diagnostics for Spatial Dependence and Spatial Heterogeneity". *Geographical Analysis*, 20.1 (1988):1- 17.

According to the Table 5.8, it is seen that p-values in all tests of both models are smaller than 0.001.

The Null Hypothesis is rejected and there is spatial autocorrelation at 1‰ significance level.

Addition to Lagrange Multiplier tests, Spatial Autocorrelation analysis is another method in which the degree of aggregation and distribution of similarities in spatial distribution is analyzed. A spatial autocorrelation tool, known as the Moran's *I* index, gives the correlation of the spatial distribution. Global Moran's *I* measures spatial autocorrelation based on both feature locations and feature values, simultaneously and determines the level of spatial dependence. If the obtained values (index; *I*) approach to +1, a positive correlation, that is, spatial clustering, but if the values are close to -1, then the distribution is a negative correlation with randomness. The Moran's *I* index is calculated with the formula;[140]

$$I = \frac{\sum_i^{26}\sum_j^{26} w_{ij}\,(y_i-\bar{y})(y_j-\bar{y})}{(\sum_i^{26}\sum_j^{26} w_{ij})\sum_i^{26}(y_j-\bar{y})^2} \tag{5.7}$$

where w_{ij} is spatial proximity between the points *i* and *j*.

On the other hand, the Moran *I* index has a global scale and measures the degree of spatial dependence of the distribution in the whole area. But it is ineligible to determine the cluster where the distribution within the area locally. The Local Moran's *I* index is calculated with the formula: [141]

$$I = n(y_i - \bar{y}) \sum_{j\neq 1} w_{ij}\,(y_j - \bar{y}) \tag{5.8}$$

Elaborately, the Anselin Local Moran *I* Index (Anselin Local Moran I Index) was developed to analyze the local distribution.[142] Given a set of features and an associated attribute, it evaluates whether the pattern generates a cluster, dispersion or random distribution.[143] Anselin Local Moran *I* value is used to investigate clusters formed by similar and dissimilar variables. A statistically high *I* value indicates a clustering of high or low values in the area around the relevant field, and a low *I* value indicates a cluster of unequal values. The *z* value also indicates the statistical

[140] Peter Rogerson, Statistical Methods for Geography. London; Sage Publications, United Kingdom (2001):167- 172.
[141] Ibid: 173.
[142] Luc Anselin, "Local Indicators of Spatial Association-LISA". *Geographical Analysis*, 27.2(1995)
[143] Retrieved from http://pro.arcgis.com/en/pro-app/tool-reference/spatial-statistics/h-how-spatial-autocorrelation-moran-s-i-spatial-st.htm, in 10.4.2018

significance of *I* value.[144] As an example for the use of spatial dependence tests, the study of Yakar (2011) is favorable. He reveals the population development and distribution of Afyonkarahisar province by spatial analysis method.

Moran's *I* statistics of all variables are listed with their p-values. For a comparison, the test is run for 2009, and then is rerun for 2011.

Table 5.9. Global Moran's *I* test for variables in 2009 and 2011.

	Moran *I* Test under randomization				
		2009		2011	
	variables	index	p-value	index	p-value
Base Model	PCGVA	0.32	1.73e-14	0.32	3.034e-14
	PCGDP	0.26	7.972e-11	0.27	2.768e-11
	D_PCGVA	0.23	5.059e-09	0.09	0.002219
	D_PCGDP	0.08	0.005152	0.07	0.007983
	LAG_PCGVA	0.33	9.621e-15	0.32	4.76e-14
	LAG_PCGDP	0.27	4.922e-11	0.26	1.481e-10
	PCELEC	0.19	5.512e-07	0.20	1.889e-07
	BACH	0.20	1.479e-07	0.18	9.074e-07
Migration Sub-components					
	NMR	0.18	9.598e-07	0.14	3.58e-05
Age	NMR_CHILD	0.19	2.799e-07	0.15	1.463e-06
	NMR_STUDENT	0.11	0.0005777	0.08	0.005149
	NMR_YOUNGADULT	0.19	5.127e-07	0.13	0.0001654
	NMR_OLDERADULT	0.001	0.1264	0.02	0.09129
	NMR_SENIOR	-0.07	0.8113	-0.03	0.4106
Gender	NMR_FEM	0.17	2.912e-06	0.13	9.18e-05
	NMR_MALE	0.19	6.266e-07	0.15	1.467e-05
Educational Attainment	NMR_LOWEDU	0.14	3.567e-05	0.17	1.834e-06
	NMR_MIDEDU	0.07	0.01115	0.04	0.04198
	NMR_HIGHEDU	0.001	0.1891	0.03	0.06774

In Table 5.9, variables with smaller p-values have spatial autocorrelation across NUTS II regions significant at 1% level. First of all, there are spatial autocorrelation of PCGVA and PCGDP, growth of PCGVA and PCGDP, their lagged forms (D_PCGVA, D_PCGDP). Except the senior and high educational net migration rates, the base model and independent variables placed as migration components have spatial autocorrelation.

The expected contribution of the study is to execute the analysis of the relationship of growth in per capita GDP/per capita GVA and net migration and its composition under the categories of age, gender and educational level. The method used to show this relationship is Ordinary Least Square (OLS).

[144] Mustafa Yakar, "Nüfus Dağılımının Mekansal Analizi: Afyonkarahisar İli Örneği". *The Journal of Internaional Social Researh*, 4.19(2011): 388- 406.

To examine the effect of migration on convergence in a spatial manner, spatial dependence was examined. Spatial Dependence has been configured through two main econometric models that are Spatial Lag Model (SAR) and Spatial Error Model (SEM).

The Spatial Lag Model is determined as:

$$y_i = \lambda W y_i + \beta x_i + u_i \; u_i \sim N\,(0, \sigma_\varepsilon^2) \tag{5.9}$$

Spatial Lag Model (SAR) assumes that the dependent variable has an effect on the adjacent dependent variable including observed local features. When constructing spatial econometric models, the lagged dependent variable is included as a descriptive variable. Y is the dependent variable vector observed along (nx1) dimensional locations and x is the vector of (nxk) dimensional explanatory variables. W is the (nxn) dimensional spatial weight matrix. λ is the autoregressive parameter that measures the effect of y in the adjacent positions on y in the corresponding position, and in most cases -1 <ρ <1 is acceptable.[145]

The Spatial Lag Model includes net migration rate and other migration components, and models were generated for per capita GDP and per capita GVA. The results are given in Tables 5.10 and 5.11.

The results of Spatial Lag Model put forth that lagged PCGDP and lagged PCGVA have negative and statistically significant (at 1% level) effects on growth of PCGDP and PCGVA, respectively. Furthermore, per capita electricity use has also diminishing impact on growth as well. For both models, bachelor rates in total population have affected positively the growth (at 1% significance level).

$$D_{pcGDP_{i,t}} = \alpha + \beta_1 pcGDP_{i,t-1} + \beta_2 pcELEC_{i,t} + \beta_3 BACH_{i,t} + \beta_4 NMR_{i,t} + \\ + \rho WD\_PCGDP_{i,t} + \varepsilon_{i,t} \tag{5.10}$$

$$D\_pcGVA_{i,t} = \alpha + \beta_1 pcGVA_{i,t-1} + \beta_2 pcELEC_{i,t} + \beta_3 BACH_{i,t} + \beta_4 NMR_{i,t} + \\ \cdots + \quad \rho WD\_PCGVA_{i,t} + \varepsilon_{i,t} \tag{5.11}$$

where *i*= region and *i*= 1, …, 26; *t*= time and *t*= 2009,.., 2011.

Instead of net migration rate variable, each component of migration has been included particularly into the model; that makes ten further models totally.

According to Table 5.10, first, λ values are more than 0.60 for all models. These values show that spatial effects are strong and indicate the positive clustering. In other words, regions tend to resemble each other subject to migration issue. Second, the lagged income variables in all models are negative and statistically significant. The

[145] Fatma Zeren, "Mekânsal Etkileşim Analizi", *Ekonometri ve İstatistik*, 12(2010):18-39.

negative value of lagged PCGDP means that the regions with higher incomes have lower growth rates compared to regions with lower incomes. In other words, regions with higher initial incomes grow less than lower-income regions.

Table 5.10. Spatial Lag Model of Growth in PCGDP between 2009 and 2011.

Model 1: D_PCGDP											
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
C	3.05 ***	3.20 ***	3.05 ***	3.07 ***	3.04 ***	3.04 ***	3.06 ***	3.04 ***	7.43 ***	7.33 ***	7.60 ***
LAG_ PCGDP	-0.35 ***	-0.36 ***	-0.35 ***	-0.35 ***	-0.35 ***	-0.35 ***	-0.35 ***	-0.35 ***	-0.77 ***	-0.76 ***	-0.77 ***
PCELEC	-0.01	-0.02	-0.008	-0.01	-0.01	-0.01	-0.01	-0.01	-0.09**	-0.08*	-0.12 ***
BACH	0.04*	0.05**	0.04*	0.04	0.04	0.04*	0.04	0.04*	0.31 ***	0.30 ***	0.35 ***
NMR	2.63										
NMR_ CHILD		-73.21									
NMR_ STUDENT			48.98								
NMR_ YOUNG ADULT				1.49							
NMR_ OLDER ADULT					72.84						
NMR_ SENIOR						87.98					
NMR_ FEM							1.80				
NMR_ MALE								9.99			
NMR_ LOWEDU									1.93		
NMR_ MIDEDU										114.22.	
NMR_ HIGHEDU											11.73
LAG_ PCGDP: NMR[1]	-0.28	8.75	-5.54	-0.11	-8.34	-11.13	-0.14	-1.13	-0.06	-13.07.	-3.12
λ	0.88 ***	0.87	0.88	0.87	0.87	0.88	0.88	0.87	0.65	0.65	0.62
p-value	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	9.434e-14 ***	1.095e-13 ***	4.89e-14 ***

[1] In this row, the other sub-components of migration are iterated in order to see the interaction of income growth and migration. (Note: *** denotes significance at 1 ‰, ** 1%, * 5% and "." at 10%.)

Interestingly, the PCELEC variable has negative marked. It indicates that regions with higher per capita electricity use in industry have lower income growth rates. In addition, BACH has also positive impacts on growth in models. It means regions with higher bachelor rate provide higher growth. In Table 5.10, the third row

from the end of the table shows the interaction parameters of lagged PCGDP migration components. This parameter helps to examine the effect of income-imposed migration components.

Nearly, all migration parameters are negative marked although only NMR_MIDEDU is significant at 10% confidence interval. The negative sign of the parameters shows that regions that receive any type of migration (except CHILD) have lower growth rates. In other words, migration causes a decrease in the income growth rate.

Table 5.11. Spatial Lag Model of Growth in PCGVA between 2009 and 2011.

Model 2: D_PCGVA											
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
C	4.56***	4.40***	4.14***	4.88***	4.44***	3.98***	4.49***	4.60***	8.57***	7.2182e+00***	6.35***
LAG_PCGVA	-0.53***	-0.52***	-0.49***	-0.57***	-0.52***	-0.46***	-0.53***	-0.54***	-0.92***	-7.9306e-01***	-0.69***
PCELEC	-0.02	-0.02	-0.02	-0.01	-0.02	-0.02	-0.02	-0.02	-0.07**	-5.2057e-02.	-0.10***
BACH	0.03.	0.03*	0.03.	0.03*	0.05**	0.04**	0.03*	0.03.	0.28***	1.8428e-01***	0.20***
NMR	29.61*										
NMR_CHILD		54.13									
NMR_STUDENT			84.60								
NMR_YOUNG ADULT				79.74.							
NMR_OLDER ADULT					224.06*						
NMR_SENIOR						572.24					
NMR_FEM							57.69*				
NMR_MALE								59.38*			
NMR_LOWEDU									109.86**		
NMR_MIDEDU										2.3563e+02***	
NMR_HIGHEDU											-18.68

(cont. on the next page)

Table 5.11. (cont.)

LAG_ PCGVA: NMR[1]	-3.20*	-5.25	-9.46	-8.60.	-24.74	-65.21	-6.21	-6.45.	-12.16 **	-2.6921e+01 ***	0.96
λ	0.84	0.84	0.84	0.82	0.81	0.82	0.84	0.83	0.49	0.60	0.67
p-value	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	2.455e-10 ***	2.2e-16 ***	2.2e-16 ***	4.28e-06 ***	4.169e-09 ***	2.455e-10 ***

[1] In this row, the other sub-components of migration are iterated in order to see the interaction of income growth and migration. (Note: *** denotes significance at 1 ‰, ** 1%, * 5% and "." at 10%.)

For PCGVA, the initial PCGVA is negative marked which indicates that regions with higher initial income have lower growth. ELEC has negative impact on growth, similar to the result of PCGDP. As seen in Table 5.11, the interaction paramters of migration components are negative signed, that is to say, they have negative influence on growth. Richer regions with higher migration rate in any kind (except HIGH-EDU) have lower growth rate. BACH for models have also positive impacts on growth.

Another spatial dependence model is Spatial Error Model (SEM). It is determined as:[146]

$$y_i = \beta x_i + u_i \tag{5.12}$$

$$u_i = \rho W u_i + \varepsilon \epsilon_i \sim N(0, \sigma_\varepsilon^2) \tag{5.13}$$

where ρ measures the degree of spatial dependence between the error of the corresponding location error term and neighboring locations, and is usually less than 1.

$$D\_pcGDP_{i,t} = \alpha + \beta_1 pcGDP_{i,t-1} + \beta_2 pcELEC_{i,t} + \beta_3 BACH_{i,t} + \beta_4 NMR_{i,t} + \cdots + \rho WD\_PCGDP_{i,t} + \varepsilon_{i,t} \tag{5.14}$$

$$D\_pcGVA_{i,t} = \alpha + \beta_1 pcGVA_{i,t-1} + \beta_2 pcELEC_{i,t} + \beta_3 BACH_{i,t} + \beta_4 NMR_{i,t} + \cdots + \rho WD\_PCGVA_{i,t} + \varepsilon_{i,t} \tag{5.15}$$

$$\varepsilon_{i,t} = \lambda W \varepsilon_j \tag{5.16}$$

where *i*= region and *i*= 1, …, 26; *t*=time and *t*= 2009,.., 2011.

Tables 5.12 and 5.13 show the results of Spatial Error Model. For spatial error model, ML panel with spatial error correlation has been used. Spatial Error Model differs methodologically from SAR models. The former assumes that there are spatial

[146] Mehmet Aydıner, "Bölgelerin Birbirlerinin İhracat Deseni Çeşitliliğine Etkisi: Düzey2 Bölgeleri Üzerine Bir Mekânsal Panel Veri Analizi" *İGÜ Sosyal Bilimler Dergisi*, 4.1.(2017): 181- 196.

autocorrelation among the error terms of the regression model. However, basically, both of them examine the spatial autocorrelation of the regression models.

In order to examine the result of Figure 5.12, it is said that the initial PCGDP have negative marked that means higher initial income causes lower growth rate. Furthermore, BACH have nearly positive impacts on growth. PCELEC, unlike the SAR results, have positive marked. Regions with higher electricity use in industry causes higher income growth. Lastly, the interaction parameters have negative signs except low and high-educated migration. The positive-marked migration components have caused lower income growth in regions.

Table 5.12. Spatial Error Model of Growth in PCGDP between 2009 and 2011.

Model 1: D_PCGDP											
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
C	0.26	0.25	0.36	0.25	0.42*	0.43*	0.28	0.25	0.30	0.40	4.6333e-01
LAG_PCGDP	-0.02	-0.02	-0.03	-0.02	-0.04*	-0.04*	-0.03	-0.02	-0.03	-0.04	-4.7799e-02.
PCELEC	0.005	0.006	0.003	0.005	0.004	0.005	0.004	0.005	0.006	0.004	6.5445e-03
BACH	0.007	0.008	0.009	0.005	0.01	0.01	0.007	0.006	0.003	-0.002	- 4.2054e-04
NMR	2.75										
NMR_ CHILD		15.44									
NMR_ STUDENT			13.10								
NMR_ YOUNG ADULT				-6.10							
NMR_ OLDER ADULT					33.68						
NMR_ SENIOR						166.44					
NMR_ FEM							6.08				
NMR_ MALE								5.11			
NMR_ LOWEDU									-4.81		
NMR_ MIDEDU										36.88	
NMR_ HIGHEDU											-1.8929e+02*
LAG_ PCGDP: NMR[1]	-0.38	-2.12	-1.50	0.49	-3.89	-19.05	-0.81	-0.74	0.38	-3.91	2.1435e+01*
ρ	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.92	0.92	0.92
P-value	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***

[1] In this row, the other sub-components of migration are iterated in order to see the interaction of income growth and migration. (Note: *** denotes significance at 1 ‰, ** 1%, * 5% and "." at 10%.)

According to Table 5.13, the initial PCGVA, PCELEC, and Bach have negative signs. That means that higher initial income, electricity use and bachelor rate have caused lower growth indeed. Similarly, Table 5.13 gives similar results with Table 5.12 in terms of interaction parameters of migration. Any kind of migration have brought lower income growth.

Table 5.13. Spatial Error Model of Growth in PCGVA between 2009 and 2011.

Model 2: D_PCGVA											
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
C	0.30	0.29	0.31	0.32	0.23	0.23	0.32	0.28	0.03	-0.05	-3.7345e-02
LAG_ PCGVA	-0.03	-0.03	-0.04	-0.03	-0.03	-0.03	-0.04	-0.03	-0.01	-0.004	-5.8043e-03
PCELEC	-0.0005	-0.002	0.0007	0.001	0.002	0.004	-0.0008	-0.0001	-0.004	-0.0005	2.4780e-03
BACH	-0.006	-0.009	-0.005	-0.0007	-0.004	-0.006	-0.006	-0.005	-0.03	-0.04.	-3.7413e-02.
NMR	8.51										
NMR_ CHILD		31.28									
NMR_ STUDENT			28.63								
NMR_ YOUNG ADULT				10.00							
NMR_ OLDER ADULT					48.77						
NMR_ SENIOR						293.58					
NMR_ FEM							19.53				
NMR_ MALE								14.19			
NMR_ LOWEDU									22.22		
NMR_ MIDEDU										52.50	
NMR_ HIGHEDU											-2.3365e+02 *
LAG_ PCGVA: NMR[1]	-0.90	-3.24	-3.04	-1.02	-5.58	-33.78	-2.05	-1.51	-2.25	-5.59	2.6855e+01 *
ρ	0.86	0.87	0.86	0.86	0.86	0.86	0.86	0.86	0.89	0.89	0.89
P-value	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***	2.2e-16 ***

[1] In this row, the other sub-components of migration are iterated in order to see the interaction of income growth and migration. (Note: *** denotes significance at 1 ‰, ** 1%, * 5% and "." at 10%.)

Overall, from spatial regression and impact analyses, we understand that there is an evidence of regional income convergence. To interpret the negative coefficient estimated for interaction variables, in general, richer regions grow smaller as they receive more net in migration than the poorer ones. In other words, increasing migration in the country favors the income convergence although the effect is weak. Moreover, particularly, migration of middle level educated and older adult group help speed up the convergence process.

In order to examine the interaction parameters and support the results, the impact factors are calculated for the interaction paramters of aggregate net migration and the other sub-components of migration obtained in SAR and SEM results. The impact factor is calculated according to the equation given below:

$$M(a) = \frac{\sigma(a)T(a)}{\sigma(b)} \tag{5.17}$$

The impact coefficients below show the effect of one SD increase in interaction variables on the GDP or GVA growth rate in terms of SD unit.

Table 5.14. The impact factors of migration parameters of SAR and SEM.

	IMPACT FACTOR			
	SAR		SEM	
VARIABLES	D_PCGDP	D_PCGVA	D_PCGDP	D_PCGVA
AGGREGATE NMR[1]	0.44	8.51	0.02	5.34
NMR: LAG_INCOME[2]	-0,05	-0,58	-0,06	-0,16
NMR_CHILD: LAG_INCOME	0,43	-0,29	-0,10	-0,18
NMR_STUDENT: LAG_INCOME	-0,28	-0,54	-0,08	-0,17
NMR_ YOUNGADULT: LAG_INCOME	-0,01	-0,57	0,029	-0,07
NMR_ OLDERADULT: LAG_INCOME	-0,19	-0,64	-0,089	-0,14
NMR_SENIOR: LAG_INCOME	-0,06	-0,43	-0,11	-0,22
NMR_FEM: LAG_INCOME	-0,01	-0,56	-0,06	-0,18
NMR_MALE: LAG_INCOME	-0,09	-0,59	-0,06	-0,14
NMR_LOWEDU: LAG_INCOME	-0,003	-0,84	0,02	-0,15
NMR_MIDEDU: LAG_INCOME	-0,48	-0,11	-0,14	-0,23
NMR_HIGHEDU: LAG_INCOME	-0,06	0,02	0,42	0,60

([1]The aggregate net migration rate is the parameter of the spatial models.
[2]This variable and the following indicate the interaction parameter of net migration rate and other migration components with the lagged income variables.)

Table 5.14 shows the impact coefficients of aggregate migration, initial (lagged) income and migration components related with the interaction parameters of SAR and SEM models (Figure 5.10, 5.11, 5.12, 5.13). First of all, contrary to PCGDP, PCGVA

has positive and higher impact factor on the income growth. It may be due to the higher capacity of PCGVA in terms of economic return. Secondly, the initial (lagged income has negative impact on growth, which may be becase of the increase in the development phases. A region with higher initial income has lower income growth rate compared to pooer region.

In addition, student, young adult, older adult and senior impact factors for PCGVA have the highest values in SAR model compared to SEM result and particular PCGDP. Growth in PCGVA has been affected negatively by female and male migration, which the latter has been quite a little higher impact factor than the former. For the high-educated migration, spatial error models have higher positive results, which have been a discrete condition among components. Regions receiving high-educated migration may have greater income growth rates. An increase of 1% in high-educated net migration rate may cause a 0.42% increase in PCGDP growth and 0.60% increase in PCGVA growth.

Different from the spatial dependence models, Local Moran *I* test shows the strong or low units that generate clusters and affect spatially their neighbors. For the interpretation, there are two important points. The first one is the sign of the value. A positive value for *I* shows that the feature has neighboring features with similarly high or low attribute values which indicates a cluster. On the contrary, a negative value for *I* states that the feature has neighbors with dissimilar values, hence this feature is an outlier. The table is given in Appendix B.

The second point is the significance of the value. To be considered statistically significant, in either condition the p-value for the feature must be small enough for the cluster or outlier. It is also important that the local Moran's *I* index is a relative measure. It can only be interpreted within the context of its computed z-score or p-value. The z-scores and p-values reported in the output feature class are uncorrected for spatial dependency.[147]

The Local Moran's *I* test gives the opportunity to see the clustering of units based on different variables. Spatial clusters of features with high or low values have been identified. In the wake of spatial dependence models, the Local Moran's *I* test has been introduced through the LISA maps produced in ArcGIS. The specifications for getting the results of Local Moran's *I* are: "contiguity edges only" option for the

[147] Luc Anselin, "Local Indicators of Spatial Association-LISA". *Geographical Analysis*, 27.2(1995)

conceptualization of spatial relationships with none standardization is selected. This concept provides polygon features that share a boundary, share a node, or overlap influence computations for the target polygon feature. Besides, "9999" for the number of permutations is selected because the increasing permutations improve the random sample distribution, which improves the precision of the pseudo p-value as well.

The Cluster and Outlier Analysis give four-fold categories with a single group of non-significant ones. A high positive z-score for a feature indicates that the surrounding features have similar values (either high values or low values). HH represents a statistically significant cluster of high values and LL indicates a statistically significant cluster of low values.[148]

On the other hand, a low negative z-score for a feature indicates a statistically significant spatial data outlier. The COType field in the Output Feature Class will indicate if the feature has a high value and is surrounded by features with low values (HL) or if the feature has a low value and is surrounded by features with high values (LH). To begin with, a basic instruction for the following illustrations is necessary. As figured out in the legend, cities represented in pink and pale blue colors show the clustering of cities either higher or lower value groups. The cities colored in dark blue and dark red represent the outlier that differs from its neighbors. The grey colored cities are not significant.

Figure 5.38. LISA Map of per capita Gross Domestic Product in 2004.

[148] The brief explanation of parameters and illustrations are retrieved in ArcGIS 10.5 Help Menu.

Figure 5.39. LISA Map of per capita Gross Domestic Product in 2014.

The Figures 5.39 and 5.40 provide the comparison of spatially induced correlations of per capita GDP and observe the change in a decade. The comparison of the Figures 5.40 and 5.41 show that the general display show a similarity except the change in Aydın that has become a low outlier among its neighbors while it was within the H-H cluster in 2004. It is a downfall for Aydın. However, Kütahya and Konya have been parts of H-H cluster in 2014 while both of them are outlier wit their neighbors in 2004. Erzincan still preserves its position as high outlier differing from its neighbors.

Figure 5.40. LISA Map of Gross Value Added in 2004.

Figures 5.40 and 5.41 show that there is a sharp distinction between east and west of the country . Eight NUTS II regions in the eastern part showed a L-L cluster in 2004 and this position has been proceeded in 2014 as well. In a decade, furtermore, there has been an upturn; the transformation of TR33 from L-H outlier into H-H cluster. As in 2004, TR33 differed negatively from its neighboring regions, in 2014 it has been a

part of H-H cluster. As a last point, TR41 has included into H-H cluster in 2014. Thus, a group of H-H clusters involves the five regions that are TR10, TR42, TR41, TR33 and TR22. That may show a spillover effect of industrial activies agglomerated especially in the hinterland of İstanbul (TR10) and on the southern part of Marmara Sea.

Figure 5.41. LISA Map of Gross Value Added in 2011.

Figure 5.42. LISA Map of Net Migration Rate in 2008

However, this display has been quitely changed in 2017. The eastern agglomeration has dispersed in a way, and Bitlis becomes a higher outlier among its neighbors. Bartın, Karabük ad Kastamonu have included in a H-H cluster. Afyon and Muğla, contrarily have become L-L cluster with their neighbors while Denizli, Isparta and Antalya have become higher outlier cities. Lastly, the H-H cluster of İstanbul, Kocaeli, Yalova, Bursa and Çanakkale have been dissolved.

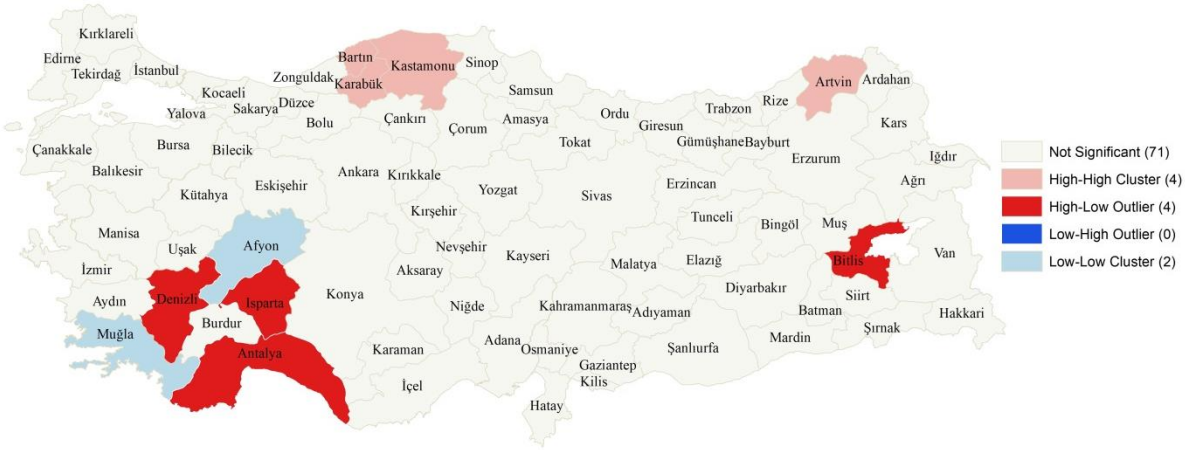

Figure 5.43. LISA Map of Net Migration Rate in 2017.

In the further part, the spatial cluster/outlier conditions have been given for the latest condition of each migration components. The ultimate data about migration shared by TURKSTAT pertains to the year of 2017. Beside the income variables, the compositional migration has been illustrated to show the grouping of cities or exception from its boundary neighbors.

Figure 5.44. LISA Map of Child Net Migration Rate in 2017.

At the first stage, the illustrations of age components would be examined. The first component of age depends on the child migration with the age below fifteen. In Figure 5.44, there are two clusters: one is on the western part as H-H cluster including Kırklareli, Edirne,Kocaeli, Sakarya, Bİlecik, Yalova, Bursa, Kütahya, Balıkesir, Çanakkale, Manisa, Denizli and Aydın and a L-L cluster in the eastern part including Gümüşhane, Bayburt, Erzurumm, Kars, Iğdır, Ağrı and Bitlis. Beside the clusters, Trabzon and Rize are a H-L outlier similar to Erzincan.

For the evaluation of this illustration, it should be regarded that the children under the age of fifteen most likely could not move without their families, hence this illustration has to show pretty similar display with young and/or older adult migration maps.

Figure 5.45 shows three clusters: two are in the western part that involve Kırklareli, Tekirdağ and Çanakkale; and Sakarya and Bolu. The other cluster represents a L-L cluster comprising Erzurum, Kars, Iğdır, Muş, Bitlis, Sirt. They are cities with lower student migration rate. Erzincan, Trabzon, and Rize are higher outlier differing from their neighbors. Similar to them, Gaziantep is a higher outlier too. Contrary to the higher outliers, Kütahya and Afyon are lower outlier among their neighbors. Differently, Tunceli is a singular city in a H-H clusterdiffering from the higher outlier Erzincan and lower outlier Elazığ, which has become such a buffer city between the two outliers.

Figure 5.45. LISA Map of Student Net Migration Rate in 2017.

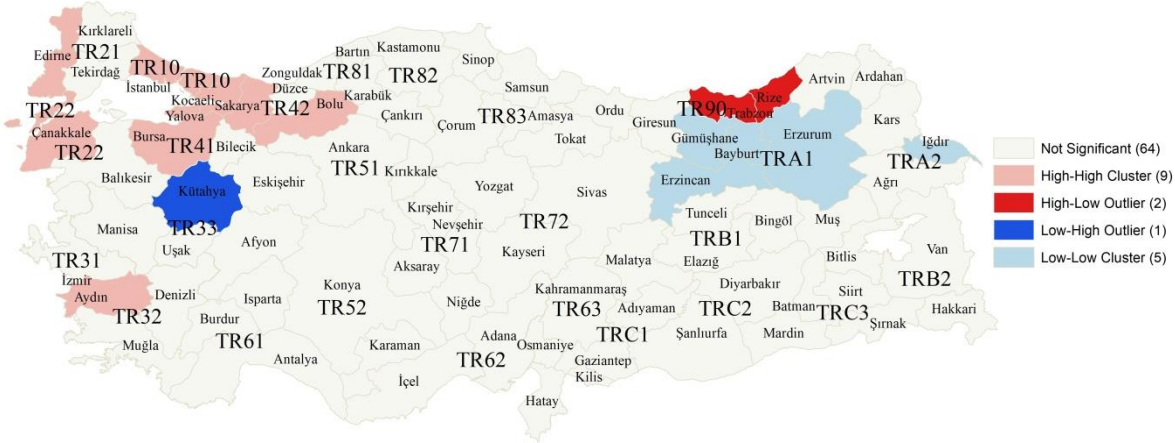

Figure 5.46. LISA Map of Young Adult Net Migration Rate in 2017.

Figure 5.46 shows the spatial correlation of young adult migration movement. There are western and eastern clusters. The H-H cluster involves Edirne, Çanakkale, Bursa, İstanbul, Kocaeli, Sakarya, Yalova, Bolu, and Aydın. Contrarily, Gümüşhane, Bayburt, Erzincan, Erzurum and Iğdır are included in L-L cluster. These cities have lower capacity to attract young adut migration, unlike the H-H cluster agglomerated in cities driving industrial activities. Kütahya has been a lower outlier among its neighbors. In contrast, Rize and Trabzon are higher outliers in receiving migration.

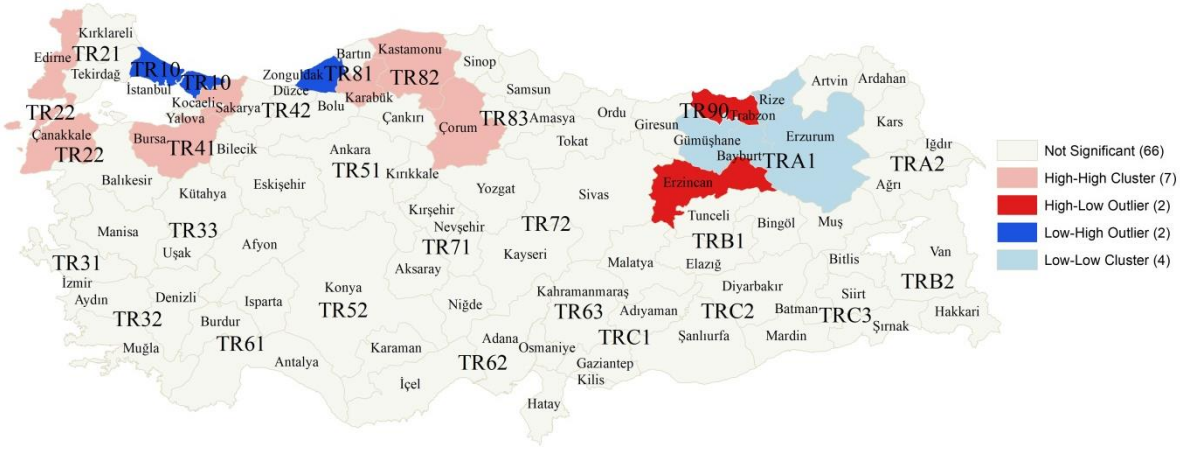

Figure 5.47. LISA Map of Older Adult Net Migration Rate in 2017.

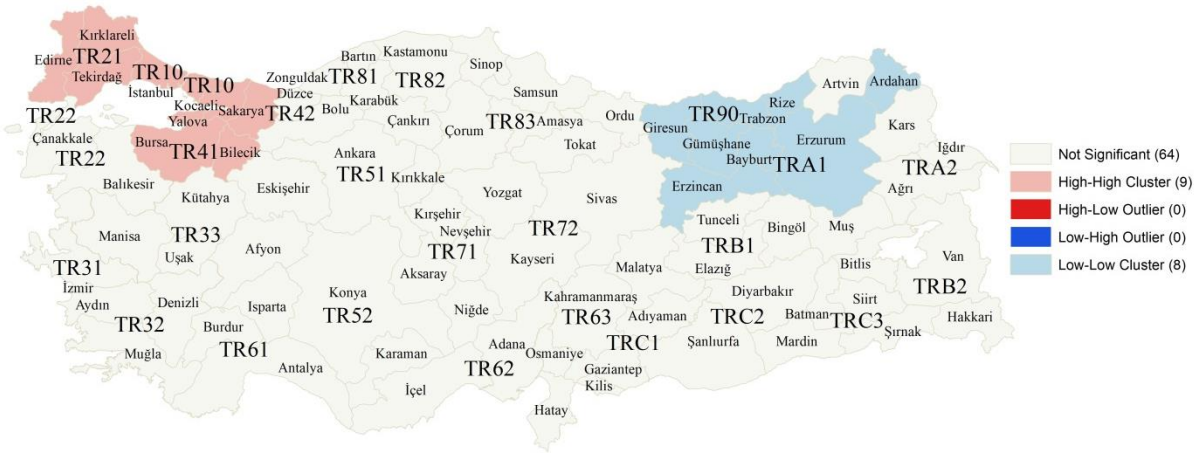

Figure 5.48. LISA Map of Senior Net Migration Rate in 2017.

When examining migration of the age above 65, Figure 5.48 shows two clusters polarized in the western and eastern part of the country. One cluster represents the agglomeration in the northwestern part including Edirne, Kırklareli, Tekirdağ, İstanbul, Kocaeli, Sakarya, Yalova, Bursa and Bilecik with the in-migration characteristics. In

spite of this cluster, Rize, Trabzon, Giresun, Gümüşhane, Erzincan, Bayburt, Erzurum, Ardahan are within the L-L cluster that immigrate senior population. Following the examination of age composition, gender has been under examination. According to Figures 5.49 and 5.50, female migration has been spatially concentrated in the two parts of the country. In the western part, the H-H cluster includes Çanakkale, Edirne, Kırkareli, Tekirdağ, İstanbul, Kocaeli, Sakarya, Bolu, Yalova, Bilecik, Bursa and Aydın, Denizli. Kütahya holds a lower outlier position between the two parts of H-H cluster. Trabzon and Rize are also higher outliers. Between of them, Gümüşhane, Bayburt, Rize, Erzurum and individual Iğdır compose L-L cluster.

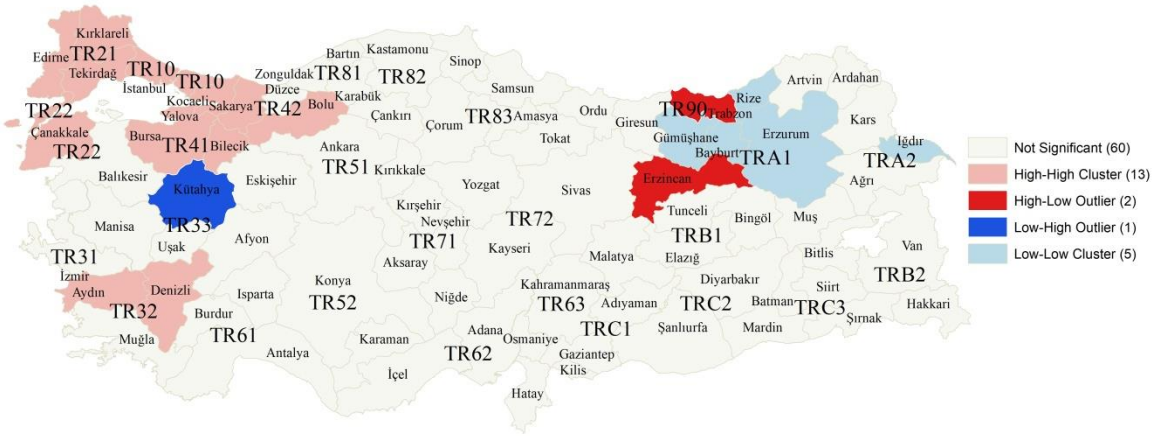

Figure 5.49. LISA Map of Female Net Migration Rate in 2017.

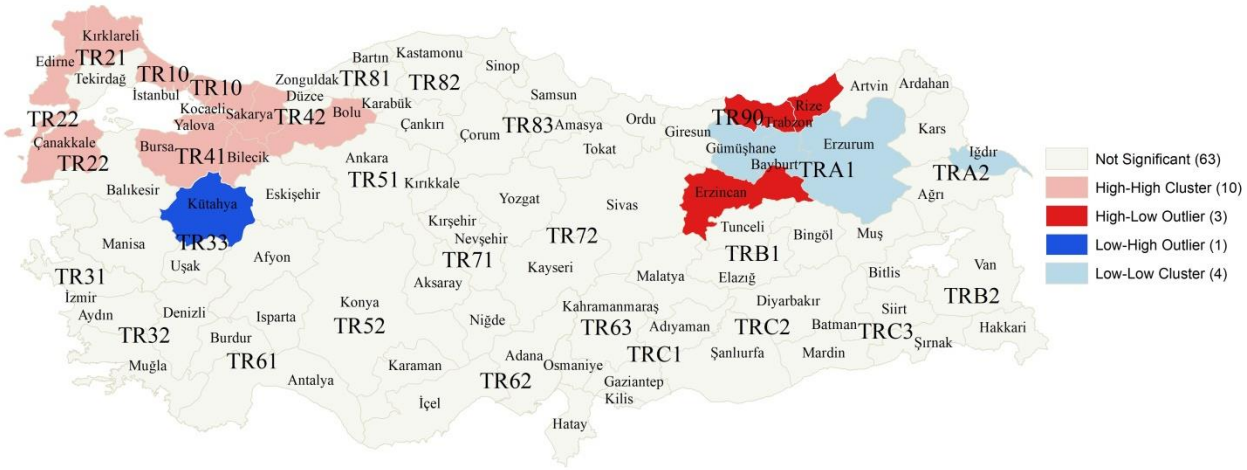

Figure 5.50. LISA Map of Male Net Migration Rate in 2017.

Figure 5.50 shows the male migration that shows quite similar display. However, female migration has an exception of H-H cluster of Aydın, Denizli compared

to male migration. Figures 5.49 and 5.50 may show that female and male population tends to move commonly together. Figures 5.51-5.52-5.53 are related with educational attainment levels of migration population. There are also some differences between the illustrations based on the low, middle and high-educated population.

According to Tables 5.51, the low educated migration has been shown. There is a H-H cluster in the northwestern part of the country. The agglomeration of the low-educated migration in this part may show also the need of low-skilled labor in the industrial-driven larger region. In this sense, Zonguldak and Kütahya become parts of the H-H cluster. Trabzon also is a higher outlier with the neighbor of L-L cluster including Erzincan, Gümüşhane, Bayburt, Erzurum, Rize and individual Iğdır. These cities tend to emigrate low-educated migration. It may be a low-educated labor flow from this cluster to the industrial region of the country.

Figure 5.51. LISA Map of Low-Educated Net Migration Rate in 2017.

Based on Figure 5.52, some outlier groups is seen different from the Figure 5.53. Kütahya and Afyon are lower outliers. Kütahya differs from its neighbors Bursa and Bilecik while Afyon dissociates from Denizli. In contrast, Trabzon, Erzurum and Erzincan are higher outliers compared to their neighbors. Rize and Bitlis are singular parts of L-L cluster. Beside this, Tunceli is within H-H cluster affected positively from higher outlier Erzincan as well.

As the last component, the illustration of high-educated migration population show clusters. H-H clusters appear in three parts of the country. Kocaeli and Yalova attract high-educated migration, similar to Aydın. Surprisingly, Mardin, Siirt, Şırnak, Hakkari and Van generate a larger H-H cluster.

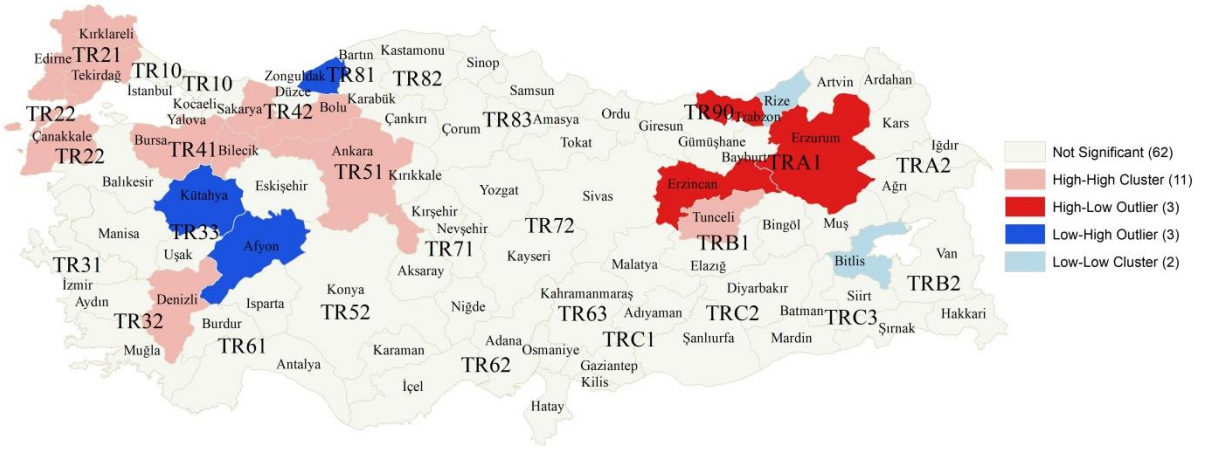

Figure 5.53. LISA Map of Middle-Educated Net Migration Rate in 2017.

It is really difficult to explain the reasons behing this high-educated migration agglomeration in the southeastern part of the country. It is obvious that there is a positive spillover in this part; however the driving force of this spillover may not be caused by new investments that attract high-skilled labor to the region. This fact needs further and detailed examination in order to find out the causes of the cluster with similar higher values of high-educated population.

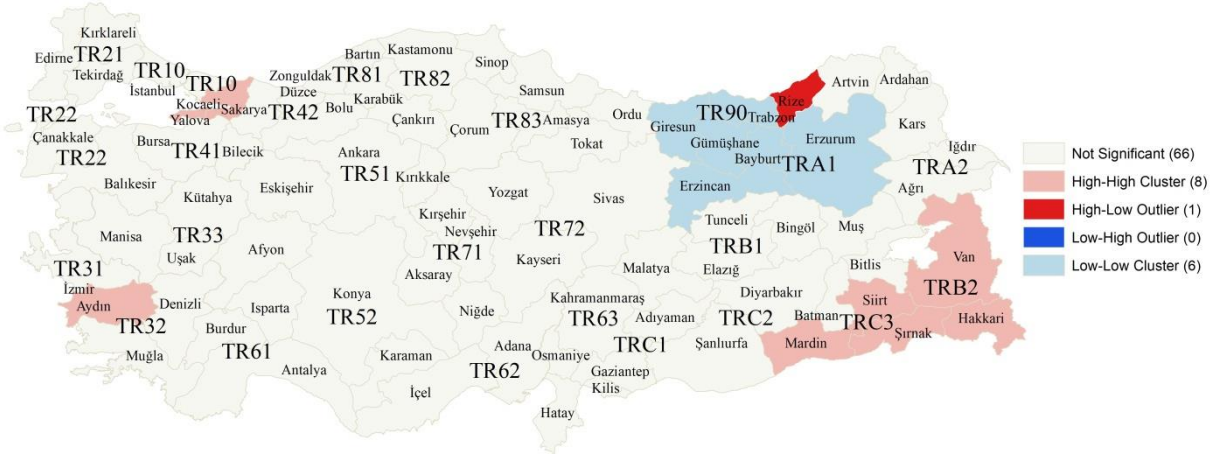

Figure 5.54. LISA Map of High-Educated Net Migration Rate in 2017.

The LISA maps provide for showing the spatial concentration of income growth and migration components. By this means, the clusters with similar features and also the outliers differ from their neighbors are seen.

The respresentation of the similarities and eccentricities are helpful to consider and examine its causes. The similarities may occur under favor of positive spillover effects of any kind of development of neighbor cities while the eccentricities are caused

by negative impacts of any development in the nearby cities. That is why the relationships between cities are under examination through this spatial analysis.

Addition to the LISA maps explained above, result of Local Moran's *I* test run in R is given in Appendix B.

According to the result, per capita Gross Domestic Product, per capita Gross Value Added, growth in PCGDP, growth in PCGVA, lagged PCGDP, lagged PCGVA, per capita electricity use in industry have statistically significant results.The results of Local Moran's *I* test are quite similar with LISA maps that have shown both clusters and outliers in terms of the spatial correlations. The Local Moran's *I* indices are calculated for the year 2009 in order to see the difference between LİSA maps and the results of Local Moran's *I* index. The difference between these two spatial configurations may be due to the changes in time.

5.8. Discussion of the Results

This chapter includes the empirical study. First of all, the results of the analyses will be expressed. Next, the synthesis of the results will be done. Lastly, the questions of the study will be examined in the light of the results.

At the first stage, the income variables per capita Gross Domestic Product and per capita Gross Value Added were under examination. The distribution of the growth in PCGDP was examined at the provincial level between 2004 and 2014 while PCGVA was examined at the regional level between 2004 and 2011. It was asserted that both trends of changes of growth in accordance with initial incomes showed a decreasing pattern. It might imply that there might be convergence in per capita incomes. The descriptive analysis put forth that there was a small evidence for convergence. As necessary, the convergence evidence was examined in the econometric analyses.

Addition to the decreasing patterns of income growth, for the same analysis, it was said that PCGDP had a greater slope. It means PCGDP was a more viable tool to explain the convergence issue. Beside that, using of two income variables provided the opportunity to see to what extent they showed similarities. Inherently, PCGDP refers to the per capita income distributed at the provincial level. However, PCGVA refers to the per capita distribution of creating value added based on the economic sectors, at the regional level. Specifically, it holds the production capacity of individuals and indicates

a higher level of productive basic sectors. Therewithal, Gross Value Added indicates the requirement of a level of skill in the production process, as well. Ultimately, PCGDP has been a more explanatory income variable for convergence pattern.

Secondly, next to preliminary facts about convergence, the human mobility indices were calculated. They contributed that human mobility was affected by the 2009 economic crisis and has been under recovery process since 2009. In 2014, the index started to increase. Briefly, it is important that the migration movement has an increasing trend. It has been demonstrated that migration has been an economically sensitive issue that may be affected by the economic fluctuations and may give rapid reactions.

In advance of econometric analyses, the spatial distribution of each variable and its changes in time was illustrated with maps. The illustrations were helpful to consider the changes in a spatial perspective. The spatial relations based on different issues (incomes and migration components) were under examination. The negative/positive spillovers or similarities/dissimilarities were represented.

There are five in-migration clusters that are higher student net migration rates. The clusters are located in Eastern Marmara (TR4) and Ankara, Western Marmara (TR2) and İstanbul, Aegean regions and TRA1 (Erzincan) and TRB1 (Tunceli, Bingöl) regions and Middle Anatolian (TR7) regions. Based on young adult migration, Tekirdağ, Kocaeli, and surprisingly Şırnak have been the nodes. Hakkari, Batman, Şırnak have been also in-migration cities in the related context. The southeastern part of the country may be a new node for in-migration flow. Furthermore, the metropolitan cities İstanbul, Adana, Diyarbakır, Van, Gaziantep lose older adult migration. It may be due to the second attempt to migrate. The previous migration attempt may be from rural/small cities to the regional industrial nodes. Similar to male migration, there has been also four regional nodes for female migration: one around İstanbul with larger extent, on the southwestern part around Muğla and Aydın, on the northeastern part around Trabzon, and on he sputheastern part around Gaziantep and Kahramanmaraş.

For low-educated migration, there are two great clusters across the country. The western part of Middle Anatolian Region (TR7) almost includes in-migration cities while the eastern part of the region is specified by out-migration cities. It may indicate that western cities may have opportunities for low-educated, low-skilled labor. Based on the middle-educated migration, there are two general clusters: one is a northwestern cluster, and the other one is located in the west of the Eastern Anatolian regions. It may

be the appearance of two nodes in the two parts, which have attracted other cities around their larger domain. Lastly, the high-educated migration has agglomerated on a line started in the frontier (border) cities of the southeastern region continued on the southern coast to coastal cities of Aegean and the Marmara Sea. There may be an agglomeration of high-educated migration on the border and coastal lines rather than inner cities of the country. It may be due to the high-skilled job opportunities available in these cities.

In addition to the discussion of the illustrations, the mobility indices have been mentioned. The regional human mobility index differs from the provincial human mobility index. This difference may depend on the greater migration occurring among provinces rather than migration between regions. When comparing the migration components, active population migration has been the greatest among the age groups including young (below 15) and senior (above 64) population. Male net migration rate is quite a little greater than the female net migration rate. Furthermore, the uneducated net migration rate is pretty greater than educated population, which refers to more capability of the uneducated population for being mobile.

With respect to per capita Gross Domestic Product, the comparison shows almost no change in a decade. The western part longitudinally from Ankara occupies the higher incomes than the average per capita GDP in the country. Quite the same figure is revealed in terms of per capita Gross Value Added. The inner Aegean provinces in the hinterland of Manisa as the industrial node are migration receiving provinces. The eastern Black Sea region also becomes an outstanding position in migration receiving regions. The NUTS II regions of Eastern Anatolian keep their positions in loss of population (emigrant regions). Based on the senior migration rates, the illustration may represent particular regions, which may receive senior migrants around their regional hinterland. A number of nodes that receive senior population have appeared.

In the econometric analysis, the convergence analysis puts forth that growth in PCGDP and growth in PCGVA have been explained by capital stock (per capita electricity use in industry) and human capital (bachelor rate in total population). This analysis is a further step in supporting the preliminary implication of Coefficients of Variations. In terms of basic growth model of incomes, the spatial tests of convergence analysis put forth the spatial autocorrelation between regions. Moran’s I test additionally have demonstrated that a great part of the dataset has been spatially correlated.

When examining convergence and migration together in the SAR and SEM models, it is revealed that migration has been a significantly important impact on economic growth. When decomposing the components of migration, the different effects have occurred. The result has supported one of the hypotheses of this study that different migration components have different impacts on economic growth. The spatial tests of growth models indicate that there is spatial autocorrelation between regions in terms of convergence-migration model (full model).

Local Moran's I result indicates the spatial clusters and dispersion of regions in terms of different variables of the full model. Furthermore, LISA maps have provided significant result about the spatial autocorrelation of migration patterns by referring to the latest data of TURKSTAT (the year 2017).

The maps illustrated have shown the clusters of high and low values and the outliers of high and low values. PCGDP has been agglomerated in the western part in a manner of the higher level while the lower level PCGDP has a broader cluster in eastern part. For PCGVA, the figuration has not been changed substantially. There has been one high-level and one low-level cluster on the west and east sides of the country, respectively.

In terms of net migration rate, the eastern agglomeration has dispersed in a way, and Bitlis becomes a higher outlier among its neighbors. Denizli, Isparta, and Antalya have become higher outlier cities that may indicate a newer node for immigration.

In the context of student migration, Erzincan, Trabzon, and Rize in the northeastern coast and Gaziantep in the southeastern part are higher outliers. These cities may be attractive nodes for the age group of 15-24. Accompanied by these cities, Çanakkale, Tekirdağ, Sakarya, and Bolu have been higher outliers that are embodied within the larger hinterland of İstanbul and Kocaeli. For young adult migration, Edirne, Çanakkale, Bursa, İstanbul, Kocaeli, Sakarya, Yalova, Bolu, and Aydın have composed H-H cluster. These cities have attracted young population that may be because of the industrial activities held in and higher PCGDP of these cities. Contrarily, Gümüşhane, Bayburt, Erzincan, Erzurum, and Iğdır have the lower capacity to attract young adult migration. Kütahya, being pretty close to the industrial nodes of Bursa, Balıkesir, Manisa, and Uşak has been a lower outlier. Rize and Trabzon, on the other hand, are higher outliers in terms of young adult immigration. The older adult migration pattern shows a significant condition that İstanbul is a lower outlier compared to its neighbors Kocaeli, Sakarya, Yalova, and Bursa within the higher cluster. With regard to gender,

female and male population tends to move commonly together. It may be an indication for family migration.

The last migration sub-group is the education attainment level. According to the recent low-educated migration, Erzincan, Gümüşhane, Bayburt, Erzurum, Rize and individual Iğdır tend to emigrate low-educated population. It may be a low-educated labor flow from this cluster to the industrial region of the country. The agglomeration of the low-educated migration in this part may also show the need for low-skilled labor in the industrial-driven larger region. In this sense, Zonguldak and Kütahya become parts of the higher cluster. Trabzon also is a higher outlier that receives low-educated migration compared to its neighbors. It may be because of job opportunities for low-skilled labor. For the middle-educated migration, it may be said that Trabzon, Erzurum and Erzincan Erzincan are higher outliers that may draw the attention of intermediate staff in industries. On the other hand, Kütahya differs from Bursa and Bilecik while Afyon dissociates from Denizli. The low outliers may be because of the lack of spread of positive industrial effects. Based on the high-educated migration, Kocaeli and Yalova similar to Aydın are within the higher cluster. Interestingly, Mardin, Siirt, Şırnak, Hakkari and Van generate a larger H-H cluster as well where there has been a positive spillover obviously.

Significant inferences may be done under favor of the impact factors of related interaction parameters revealed in SAR and SEM models. Firstly, PCGVA has positive and higher impact factor on the income growth. Secondly, the initial (lagged) income has a negative impact on growth, which may be because of the increase in the development phases.

Based on PCGVA, student, young adult, older adult and senior impact factors have the highest negative values in SAR model compared to SEM result. Briefly, growth in PCGVA has been affected negatively by female and male migration. High-educated migration has affected growth positively for both incomes. An increase of 1% in high-educated net migration rate may cause a 0.42% increase in PCGDP growth and 0.60% increase in PCGVA growth.

When overlapping and reexamination of the overall results under the research questions, some general results could be affirmed. First of all, PCGDP has been more explanatory for the income growth. Secondly, human mobility has increased since 2009 when a global economic crisis affected.

In addition, in terms of income distribution, the higher and lower clusters have been; however, the higher growth rate of cities are located in the eastern regions. It may be an indication of the greater growth of poorer cities compared to lower growth rates of initial richer cities.

There are different migration patterns based on its composition. For student migration, there are five clusters one of three are located in middle Anatolian and its eastern part. Based on young adult migration, the southeastern part of the country may be a new node for in-migration flow. Furthermore, the big cities of İstanbul, Adana, Diyarbakır, Van, and Gaziantep have been losing older adult migration. Similar to male migration, there has been also four regional nodes for female migration at the four end of the country. It may be referred to a staged migration from small/rural cities to an upper-stage city, then as the second attempt into big cities. There are also two main clusters for low-education immigration. The western part of Middle Anatolian Region (TR7) involves immigration cities while the eastern part of the region is specified by emigration cities. Based on the middle-educated migration, there are two general clusters: one is a northwestern cluster, and the other one is located in the west of the Eastern Anatolian regions. Finally, high-educated migration has been developed on the line of the border cities of the southeastern region and coastal cities from South to Marmara region. Unlike the inner cities, there may be asserted that border and coastal cities may attract more high-educated migration due to climatic reasons.

Provincial migration occurs more than the provincial migration in the same region. People tend to migrate to any city outside of the region where the initial city has been located. It may be described as the attempt of leaving the city with its NUTS II region. There may be quite a little-staged migration within the same NUTS II region.

The result of LSDV model has referred to convergence supported by the CoV. Also, the variables in the base model have been correlated spatially. SAR and SEM models, on the other hand, have given the importance of components of migration. Migration components have different impacts on economic growth, as expected.

In a few words, growth in PCGVA has been affected negatively by female and male migration. High-educated migration has affected growth positively for both incomes. An increase of 1% in high-educated net migration rate may cause a 0.42% increase in PCGDP growth and 0.60% increase in PCGVA growth.

Taking everything into consideration, it is said that there have been income inequalities between regions. With a general increase in time, migration has different

patterns across the country, based on its sub-components. Without the migration effects, income growth has been affected by the initial incomes and bachelor rates. Regions with lower initial income have a greater growth rate. It may support the hypothesis of convergence, as well. As the last emphasize has been the different impacts of migration components. Except for high-educated migration, all sub-components have a negative influence on income growth. Hence, regions receiving migration with higher initial incomes will have less income growth.

CHAPTER 6

CONCLUSION

6.1. General Evaluation

In this study, a relatively less addressed issue, namely the impact of migration on the evolution of regional income inequalities in Turkey has been empirically analyzed.

In the methodological progress of the study, the descriptive analysis, spatial exploratory illustrations, econometric analysis are applied. The descriptive analysis is used to show the basic condition of income growth and the preliminary fact about the relationship between income growth and migration. The spatial exploratory illustrations are helpful to see the change in income and migration variables in time and spatial perspectives (except PCGVA, all the variables are represented in provincial level).

The dependent variable is the change of per capita Gross Domestic Product and per capita Gross Value Added, in other words, they indicate the economic growth. The independent variables in the base model are per capita electricity use in industry, bachelor rate in the total population. Net migration rate and the components of migration expand the scope of the study to uncover the migration impacts on economic growth.

After 2000, the address-based population registration system went into operation, and the way of data collection and the regional system were quite changed. A disconnection in the datasets shared by the official statistical institution of Turkey (TURKSTAT) occurred between “before 2000” and “after 2004.”

The results can be summarized in five parts. First, regional income inequalities are found to be quite sizable in Turkey. The spatial configurations (maps) demonstrate that the country embodies much inequality which is differentiated in terms of sub-components. Despite the existence of regional inequalities, they are in the decreasing tendency.

Second, income disparities tend to decline and regions tend to converge each other. The neoclassical proposition of diminishing returns of capital and convergence is

also supported in this case. The convergence analysis of the base model gives a reference to convergence.

Moreover, the novel contribution of the study is to put forth the recent relation of economic growth and convergence at the provincial and regional levels. It is stated that migration has an extenuating impact on inequalities. It is also revealed that growth in "in-migration regions" is less than the "out-migration regions." Migration decomposed into different components has differentiating impacts on economic growth.

With this study, it is put forth that regional inequalities kept in the provincial and regional levels in Turkey are affected by migration. In the context of previous related studies in Turkey, the case of Turkey contributes to the debate of convergence-migration relation and emphasizes the significance of compositional migration.

Third, according to human mobility index, people tend to be more mobile in recent years, with the only exception of 2008-2009 economic crises. In particular, young adult and student population regarding the age groups, middle-educated population regarding educational attainment levels and relatively female population regarding gender are found to be more mobile.

Fourth, increasing migration in Turkey is found to reduce income disparities across regions. In other words, regions which are more developed and which are receiving more net in-migration tend to grow slower than the relatively poorer regions.

Fifth, to interpret the negative coefficient estimated for interaction variable, in general, richer regions grow smaller as they receive more net in-migration than the poorer ones. In other words, increasing migration in the country favors the income convergence although the effect is weak. Moreover, particularly, migration of middle level educated and older adult group help speed up the convergence process.

All these results have important implications for regional development planning and policies. Migration is an important subject that would be managed through the means of public policies. The active-age and skilled population should be directed to backward regions in order to increase the productive base of the regional economy.

The regional policies should be prepared after a detailed investigation of each province in NUTS II regions. In this sense, this study would ensure a comparative base to examine the inter-provincial, inter-regional and intra-regional conditions with regards to income inequalities and migration patterns. In further studies, the reasons of the economic growth in some regions that generate regional inequalities may be examined. In addition, the state means such as recent Development Plans, investment incentives

and many other political economic tools may be examined in order to find out the roots of economic imbalances. Furthermore, it is important how state controls the migration movements in Turkey. The direction and the density (amount) has to be analyzed by institutions. The state incentives may enable to get a balanced economic realm among the provinces of Turkey in long-run.

6.2. Policy Implications

The regional perspective gives the opportunity to learn the spatial clusters or dissociation of features. Hence, the estimations and policies directing for these features have certainly to include spatial perspective.

For the economic policies, regarding the distribution of income growth in the country is an auxiliary means. It gives the clues of the changing patterns in time. In addition, the representation of cities whose economic significance increase or decrease may lead the direction of further investments of state and private sectors. At this point, the investments have to be controlled by state apparatus since the less-developed regions may not attract the private entrepreneurs to invest in their regions.

In the context of this study, migration has occupied an important body. Besides the economic policies, migration has to be controlled as well. Speaking of controlling migration does not mean hinder the migration movements. The sense of controlling the migration is to ensure the out-migration and in-migration cities in a balance.

Migration has been an effective factor on the balancing of income inequalities, but with a smaller impact. Hence, migration should not be regarded as a means to stabilize the economic growth. In contrast, the economically less-advantageous cities with higher emigration should be put into the urgent category for development policies.

At this point, Şanlıurfa, Diyarbakır, Batman, Bingöl, Muş, Bitlis, Van, Hakkari, Ağrı, Kars are at the lowest level of per capita Gross Domestic Product, for the year 2014. However, among them, Şanlıurfa, Diyarbakır, Batman, Hakkari, Ağrı have lower growth rates in PCGDP in a ten-year period. Hence, these five cities are the highest priority cities in terms of the provision of investment in order to increase their production capacity. Apart from these, Kayseri, Nevşehir, Ankara, Antalya, Muğla, Denizli, Aydın, Balıkesir and Tekirdağ have growth rates less than 30%. The reason for this lower growth rate may be due to the their individual economic saturations, some economic obstacles exist in their regional context.

It is figured out that there is a convergence pattern in per capita income of regions in Turkey, but at a slow rate. Because of this pattern, cities that are growing should take further investments to increase their production level. These cities are Trabzon, Rize, Erzurum, Muş, Van, Şırnak, Adıyaman, Aksaray, Kırıkkale, Zonguldak, Karabük, Kütahya, Uşak, Kocaeli, and Yalova. These cities almost are grouped into some clusters that are neighbors. It may show the positive spillover effects of cities. Above them, Bingöl, Bitlis, Siirt, Mardin, and Osmaniye have the highest growth rates that have lower PCGDP in 2014. These cities also have to be supported by state investments.

Based on Figure 5.13 and Figure 5.14, some cities above are mentioned to promote economic policies. These illustrations are helpful to consider a further evaluation.

Consideration of the migration movements, Gümüşhane, Bayburt, Ağrı, Muş, Van, Kars, Ordu, and Giresun are the out-migration cities (Figure 5.18). This may cause the production capacity based on the labor force. According to Figure 5.24, Gümüşhane, Bayburt, Ağrı, Muş, Van, Kars, Ordu and Giresun also are the highest younger adult out-migration cities. Beside this, based on Figure 5.26, Gümüşhane and Bayburt are the highest two, and Ordu and Giresun are the next two cities in the context of older adult out-migration. Briefly, Gümüşhane, Bayburt, Ordu, Giresun (the highest priority), then Ağrı, Muş, Van, Kars are the priority cities to control the out-migration movements.

The reasons behind the out-migration, especially young adult and older adult migration (active population between 25-64) have to be investigated.

In the convergence hypothesis, out-migration provides the opportunity for the cities to increase per capita income; however, it may cause economic problems in the long-run.

As a result, it is understood that there is an evidence for regional income convergence. To interpret the negative coefficient estimated for interaction variables, in general, richer regions grow smaller as they receive more in-migration than the poorer ones. In other words, increasing migration in the country favors the income convergence although its effect is weak. Particularly, migration of middle level educated and older adult group help speed up the convergence process. However, the convergence pattern may not refer to an overall betterment of the cities; on the contrary, it may hinder some hidden causes to be revealed.

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APPENDIX A. DETERMINATION OF CITIES FOR SPATIAL ANALYSES FROM THEIR AFFILIATED REGIONS.

NUTS II regions	Cities	NUTS II regions	Cities
TR10	*İstanbul*	TR71	*Kırıkkale*, Aksaray, Niğde, Nevşehir, Kırşehir
TR21	*Tekirdağ*, Edirne, Kırklareli	TR72	*Kayseri*, Sivas, Yozgat
TR22	*Balıkesir*, Çanakkale	TR81	*Zonguldak*, Karabük, Bartın
TR31	*İzmir*	TR82	*Kastamonu*, Çankırı, Sinop
TR32	*Aydın*, Denizli, Muğla	TR83	*Samsun*, Tokat, Çorum, Amasya
TR33	*Manisa*, Afyonkarahisar, Kütahya, Uşak	TR90	*Trabzon*, Ordu, Giresun, Rize, Artvin, Gümüşhane
TR41	*Bursa*, Eskişehir, Bilecik	TRA1	*Erzurum*, Erzincan, Bayburt
TR42	*Kocaeli*, Sakarya, Düzce, Bolu, Yalova	TRA2	*Ağrı*, Kars, Iğdır, Ardahan
TR51	*Ankara*	TRB1	*Malatya*, Elazığ, Bingöl, Tunceli
TR52	*Konya*, Karaman	TRB2	*Van*, Muş, Bitlis, Hakkari
TR61	*Antalya*, Isparta, Burdur	TRC1	*Gaziantep*, Adıyaman, Kilis
TR62	*Adana*, Mersin	TRC2	*Şanlıurfa*, Diyarbakır
TR63	*Hatay*, Kahramanmaraş, Osmaniye	TRC3	*Mardin*, Batman, Şırnak, Siirt

APPENDIX B. MORAN'S I TEST RESULT IN 2009

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
TR10	0.97***	0.98***	0.35***	0.37**	0.96***	0.94***	-0.14***	0.38***	0.61***	0.30***	0.75***	0.63***	-0.34	-0.41	0.60***	0.61***	0.44***	0.46***	-0.12
TR21	0.74***	0.63***	0.24***	0.031	0.74***	0.63***	0.39***	0.21***	0.55***	0.34***	0.53***	0.57***	0.01	-0.03	0.50***	0.59***	0.52***	0.31**	0.07
TR22	0.24***	0.21***	0.15***	-0.19	0.23***	0.23***	0.45***	0.27***	0.19*	0.21***	0.01***	0.15	0.11	0.11	0.17	0.22**	0.23***	0.06	0.01
TR31	0.41***	0.27***	0.17***	-0.09	0.15***	0.28***	0.34***	0.2***	0.10	0.16***	0.05***	0.07	-0.02	-0.02	0.10	0.10	0.14***	0.03	-0.07
TR32	0.17***	0.16***	-0.12***	0.01	0.19***	0.16***	-0.01***	0.25***	0.18	0.17***	0.02***	0.20	0.06	0.03	0.18	0.17	0.20***	0.07	-0.03
TR33	0.23***	0.06***	0.08***	-0.18	0.23***	0.08***	0.23***	-0.15***	0.09	0.05***	0.05***	0.16	-0.08	-0.13	0.09	-0.09	0.00***	0.05	-0.08
TR41	0.66***	0.48***	0.42***	0.31**	0.64***	0.45***	0.44***	0.3***	0.40***	0.34***	0.29***	0.37***	0.11	0.10	0.38***	0.42***	0.41***	0.22*	0.00
TR42	0.85***	0.72***	0.65***	0.63***	0.81***	0.65***	0.47***	0.21***	0.44***	0.29***	0.48***	0.40***	0.05	-0.05	0.44***	0.44***	0.39***	0.35*	0.03
TR51	0.17**	0.17***	0.004***	-0.36	0.16***	0.14***	-0.07***	0.17***	0.02	0.11***	0.13***	0.07	0.00	0.00	0.00	0.03	0.08***	0.12	-0.19
TR52	-0.02***	-0.02***	0.05***	0.03	-0.04***	-0.033***	0.03***	0.004***	0.02	0.06***	0.02***	-0.01**	-0.01	-0.04	0.03	0.01	0.02***	0.02	0.15**

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Appendix B (Cont.)

	TRA1	TR90	TR83	TR82	TR81	TR72	TR71	TR63	TR62	TR61
1	0.31***	0.032***	0.003***	-0.06***	0.17***	0.01***	0.005***	0.12***	0.02***	0.16***
2	0.26***	0.04***	-0.004***	-0.01***	-0.09***	0.002***	-0.01***	0.09***	0.01***	0.19***
3	0.24***	-0.12***	-0.17***	-0.26***	0.3***	-0.07***	-0.079***	-0.002***	-0.01***	-0.13***
4	0.33***	0.08	0.02	0.04	0.37***	0.01	0.05	0.006	-0.06	-0.12
5	0.29***	0.02***	-0.002***	-0.04***	0.13***	0.02***	0.007***	0.13***	0.01***	0.17***
6	0.23	0.03***	-0.003	-0.01***	-0.16	0.01***	-0.01***	0.09***	0.01***	0.19***
7	0.45***	0.07***	0.02***	-0.02***	0.26***	-0.003***	-0.02***	-0.07***	0.01***	-0.02***
8	0.01***	-0.01***	-0.005***	-0.05***	0.04***	0.001***	-0.02***	0.07***	-0.04***	0.16***
9	0.22**	0.11	0.05	-0.05	-0.24	0.03	-0.04	0.01	0.01	0.17*
10	0.35***	0.05***	0.01***	-0.05***	-0.06***	0.00***	-0.06***	0.00***	0.00***	0.21***
11	-0.23***	0.11***	0.00***	-0.09***	-0.22***	0.03***	0.03***	0.09***	0.07***	0.05***
12	0.39***	0.23**	0.14	-0.06	-0.28	0.07	-0.01	0.01	-0.01	0.16
13	0.06	0.04	0.10	-0.04	-0.18	0.00	-0.07	0.02	0.03	0.06
14	0.02	-0.15	-0.03	0.00	-0.19	-0.12	-0.12	0.00	-0.01	0.06
15	0.19*	0.11	0.05	-0.06	-0.27	0.03	-0.05	0.01	0.00	0.18**
16	0.25**	0.11	0.05	-0.03	-0.22	0.03	-0.02	0.02	0.01	0.17**
17	0.35***	0.06***	0.02***	-0.03***	-0.18***	0.01***	-0.08***	0.00***	-0.01***	0.19***
18	-0.50	0.08	-0.01	-0.01	-0.36	0.03	0.06	0.18*	0.14*	0.07
19	-0.36	0.17*	0.19**	0.08	0.00	0.21**	0.29**	0.02	0.05	-0.10

(cont. on next page)

Appendix B (Cont.)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
TRA2	0.6***	0.55***	0.42***	0.34***	0.57***	0.51***	0.76***	0.39***	0.46***	0.62***	0.09***	0.42***	0.23**	0.16*	0.44***	0.48***	0.65***	-0.04	-0.18
TRB1	0.21***	0.19***	-0.01***	0.03	0.22***	0.19	0.04***	-0.05***	-0.05	0.00***	-0.23***	0.05	-0.06	-0.14	-0.03	-0.07	-0.02***	-0.29	-0.01
TRB2	0.84***	0.77***	0.32***	0.01	0.81***	0.76***	0.76***	0.79***	0.45***	0.61***	0.22***	0.31***	0.22**	0.10	0.41***	0.50***	0.65***	0.14	0.29**
TRC1	0.25***	0.16***	0.04***	-0.02	0.25***	0.17	-0.03***	0.15***	-0.02	-0.02***	0.05***	-0.06	0.00	0.00	-0.02	-0.02	-0.01***	0.09	-0.06
TRC2	0.62***	0.61***	0.01***	0.14	0.65***	0.6***	0.39***	0.65***	0.05	0.10***	0.03***	-0.02	0.08	0.03	0.04	0.06	0.09***	0.04	0.16*
TRC3	0.59***	0.61***	-0.07***	0.06	0.62***	0.61	0.46***	0.86***	0.11	0.21***	0.13***	-0.08	0.11	0.08	0.09	0.14	0.21***	0.14	0.30**

(Note: The variables are assigned respectively (1)PCGVA, (2)PCGDP, (3)D_PCGVA, (4)D_PCGDP, (5)LAG_PCGVA, (6)LAG_PCGDP, (7)PCELEC, (8)BACH, (9)NMR, (10)NMR_CHILD, (11)NMR_STUDENT, (12)NMR_YOUNGADULT, (13)NMR_OLDERADULT, (14)NMR_SENIOR, (15)NMR_FEM, (16)NMR_MALE, (17)NMR_LOWEDU, (18)NMR_MIDEDU, (19)NMR_HIGHEDU.
*** denotes significance at 1%, ** 5% and * at 10

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