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The Role of Government in Economic Environment Augmenting Activities[ǂ]

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ABSTRACT

Regional disparities are important concerns for the researchers as well as the policy makers in both developed and developing countries. The government, as a leading actor in regional policies, can create externalities through investments not only in the real sectors, but also in infrastructure and institutions. Investments in education, health and transportation enhance the quality of life and business environment, and trigger the development in those regions. The paper defines this type of government role in a particular region as "economic environment augmenting activities of the government". The paper focuses on two types of initiatives of the government: regional universities and the existence of an airport. The main findings show that spending impact suppresses knowledge impact in the low income provinces. And, there is a threshold for the regional income level: The demand effect of government initiatives as state university and providing air transport has greater impact in low-income provinces, particularly before 2000.

Key Words: Regional convergence; role of government; effects of universities; panel-data modeling; Turkey

JEL Codes: O18, R11, R58

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1. INTRODUCTION

In the late 19th century and early 20th century, Marmara (Istanbul and Bursa), Aegean (Izmir) and South Region of Turkey (Adana) were important economic centers of the Ottoman Empire. These regions are located in the West and South sides of the country. The West side of Turkey continues to be developed while the East side regions still struggle with lack of school, hospital, and poor economic activities. Hence, the basic structure of regional differences did not change structurally over the last century. Starting from 1980s, Turkey has launched comprehensive liberalization policies; after three decades of implementation, there emerged some new industrial centers in the Marmara and Aegean (situated in the West side), and even in the Center Anatolian regions of Turkey.[1] However, the main structure of the regional development trend did not change over the three decades and the shift has happened in the West side. The East provinces continue to battle poverty and migration to the West provinces due to poor access to education and health facilities, and low level economic activity in their regions.

The aim of the paper is to investigate the effects of government activities in the regional convergence process of Turkey. To this end, it is useful to decompose the contributions of the government towards the development of human capital through education and health, improvement of infrastructure, and investments in service sectors, particularly in the communication sector. However, the existence of manufacturing in a particular region and share of the manufacturing sector in the regional income are other vital factors for regional economies beyond the government actions. Furthermore, government initiative may also affect manufacturing, and indirectly, factors affecting manufacturing could be important in

[1] The regional evaluation is based on (Dogruel and Dogruel, 2006).

regional process. This study defines this type of government role in a particular region as "economic environment augmenting activities of the government."

The paper first gives a particular attention to the development of the human capital through local state universities. Universities have a crucial role in the creation of regional innovation systems through their research activities and the collaboration with the local business. They have also significant contribution to the education of local employment. These are the *knowledge impacts* of regional universities. However, they have further impacts on the regional economic systems: the *spending impact* through their budget expenditures. Thus, the paper considers the effects of universities in a region as knowledge and expenditures. Communication and transport may be other important contributions of government. Nevertheless, communication investments are excluded due to the easy access to communication tools, such as telephone. The communication investment in Turkey was almost completed before the period covered by the paper. Therefore, communication is not a distinct factor among the regions.[2] Also the transport investments, especially the access to air transport (the existence of an airport), would create more distinct externality vis-à-vis communication. Hence, the existence of an airport in a particular region is considered as an indicator of government investment in this study. The last convergence issue in the analysis is the share of manufacturing sector. The paper takes the other contribution of the government investments in social and physical infrastructures other than accessing air transport, as the complementary to the investments in education. The panel analysis is employed to estimate the effects of government investments on the regional convergence. The paper focused on two different periods: 1990-2000 and 2004-2008 due to different data structure in these two periods.

[2] It would be interesting to consider access to the internet if there are data.

The findings show that university expenditure impact suppresses knowledge impact in the low income provinces. However, there is a positive and significant knowledge effect of universities on manufacturing in the high-income provinces until 2000; this effect cannot be observed in the low-income provinces. University expenditures have also positive and significant effects on the service sector in all regions for the first period, while the effect is significant only for low-income regions for 2004-2008. Finally, the existence of an airport has an effect on both group regions; its effect is stronger in the low-income provinces until 2000, however because of data limitations, it difficult to see a clear effect for the second period.

The plan of the paper as follows: The second section outlines the "economic environment augmenting activities" of the government. The third section displays the regional disparities in Turkey employing some descriptive statistics. This section also covers several convergence studies on regional differences in Turkey. The fourth section outlines the empirical approach and exhibits the quantitative results. The last section concludes the paper.

2. ON THE ECONOMIC ENVIRONMENT AUGMENTING ACTIVITIES OF THE GOVERNMENT

The regional differences are not common problems of only developing countries, but also of developed countries. This problem was widely discussed in development economics and economic geography offered some idea about the determinants of localization of economic activities which are important for regional growth. "*In spite of all efforts to find a universal model to explain the issue, economists are still far from a consensus. On the one hand, this is probably an outcome of the complexity of the regional differences within a country* (Dogruel and Dogruel, 2006)." On the other hand, this may be a dilemma of government policies: There is a contradiction between overall economic efficiency and preferential regional policies (Markusen, 1995). Governments are more sensitive to overall economic efficiencies

and/or growth issue than regional differences. As a result, regional disparities are important concerns for researchers as well as policy makers in both developed and developing countries; and it seems that, discussion on regional differences will continue for a long time.

In general, the shares of agricultural or industrial sectors value added are used to explain the regional differences. However, the regional social and physical infrastructures such as availability of education, health, transportation and communication facilities have gained less attention. The government, as a leading actor in the regional policies can create externalities through investments not only in the real sectors, but also in infrastructure and institutions. These externalities are crucial in regional dynamics.

The regional externality concept is based on the seminal work of Marshall's (1920), *Principles of Economies*. These externalities are called as "*…the Marshallian Trinity: labor market pooling, supplier specialization, and knowledge spillovers* (Cortright, 2006:8)." The new geography has strong ties with this concept. But, Krugman must be referred (1991a) as a leading work in this field.[3] The regional differences and the first convergence concept were discussed in Barro and Sala-i Martin (1991b).[4] The literature has numerous empirical studies of regional convergence.

The studies on the link between public infrastructures (particularly transport infrastructure) and growth show that the outcomes of researches may differ between regions and countries. It is possible to indicate some examples. Holtz-Eakin and Schwartz (1995) could not find strong quantitative evidence on the highway-regional productivity issue in US. However, they emphasize that "spillover benefits differ significantly across industries" and they stress the need for further analysis. Boopen (2006) found that transport capital has a contribution

[3] Krugman (1991b) may be cited as well.

[4] Barro and Sala-i Martin (1991a, 1992, 1995 and 2004) may also be referred. They scrutinize whether poor countries grow faster than rich ones and for this purpose, they applied the new growth theory to the convergence concept by examining the period 1840-88 for 48 US states and 1960-85 for 98 countries. They found evidence for absolute and conditional convergence respectively.

to the development of African countries. Yamaguchi (2006) found mixed results between the infrastructure development in air transport (access to interregional air transport) and per-capita GDP growth for "core and peripheral areas in Japan."

University role in development is not restricted with the teaching and research. They can participate to the regional development process through stimulating the business environment. In the small regions, they can affect development by their budget and employment. An economic impact survey on "American state universities" provides an example for this argument:

> *"The 2000 Economic-Impact Survey (…) found that states' investment in public universities generate significant jobs, additional spending, and increased tax revenue for local and regional economies. The economic benefits take many different forms. But the data clearly demonstrate that state-supported universities remain powerful engines for economic stability and growth: The average return on every $1 of state money invested in a NASULGC [National Association of State Universities and Land-Grant Colleges] institution is $5 (Henderson, 2001: 8)."*

Newlands's paper is related to this economic impact. In addition, the knowledge impact is considered in the paper: Newlands (2003) divides economic impacts of universities in their regions into spending impacts and knowledge impacts. The effects of consumption and capital spending on income and employment refer to spending impacts while production of highly educated graduates and the production and dissemination of knowledge is regarded as knowledge impacts. The paper reviews a number of studies of the roles of European and American universities in contributing to regional competitiveness in learning economy and states that the role of universities is overstated.

The different knowledge effects of universities are extensively discussed as research questions. Drucker and Goldstein (2007) found that research universities have increasing

importance in economic development in the U.S. Their results show knowledge-based activities (they indicate teaching and basic research) have significant positive effects on regional economic development. The new studies emphasize the role of universities considering the effect of globalization: As an example, Audretsch et al. (2007:11) define industry structure in the business environment of a region with the cooperation of a university.[5] D'Costa (2006) discusses a different type of business environment in the Indian software industry.

There are other examples from the literature that emphasize university role through "knowledge effect" in development. The knowledge effect appears in different forms:

Karlsson and Zhang (2001) start with the question of the relationship between knowledge generation, economic growth and development. They consider the research universities to be the main actors in knowledge generation due their role in research and development (R&D) and educating skilled research personnel. Aggregation of universities is therefore considered as the knowledge sector in endogenous growth models, which produces human capital or R&D. Thus, spatial distribution of knowledge becomes important for regional economic growth.[6]

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[5] "Globalization has made it possible for manufacturers to not only find, but to use, the cheapest inputs for their businesses. However, it turns out that only the production of standardized and labor-intensive inputs has been shifted to countries with competitive labor costs; capital-intensive production tends to stay close to home. In the automobile industry, for example, it is generally true that first- and second-tier suppliers are located in direct proximity to the original equipment manufacturer (OEM). The low vertical integration in this industry necessitates close coordination between OEM and important suppliers to phase production processes and assure just-in-time and justin-sequence production. Thus, R&D cooperation is particularly important for process innovations. Further, this network is often complemented by universities as well as by various types of service providers, including commercial cleaners and warehousemen, jobs likely to be filled by low-skilled workers (Audretsch et al., 2007:11)."

[6] Starting with these views in mind, they propose a dynamic two-region model with human capital accumulation. The only university in the economy is located in region 1. Dynamic interdependence between human capital accumulation, regional division of labor, spatial price structure under perfect competition and the government intervention in R&D and higher education is explained in the model. The model examines the effects of differences in human capital improvements and environmental conditions among two regions.

Chakrabarti and Lester (2002) see universities as a potential source of technology. According to the authors, a firm can both obtain knowledge and technology from a university and recruit graduates and faculty to serve as employees and consultants which makes the universities unique. Thus, the importance of university-industry alliances for advancing knowledge and new technologies is stated. For their explanatory study, they take eight universities, four from the U.S. and four from Finland. The investigation stresses the role of national policies and governmental agencies in promoting university-industry collaborations.

University-industry collaboration is also investigated using "Triple-Helix Model." The model involves government in addition to university and industry as a collaborator for regional development.[7] It is possible to refer to two examples which employ this model: Arbo and Eskelinen (2003) use the triple helix framework to investigate the experience of two Nordic universities, Joensuu in Finland, and Tromsø in Norway. The conclusions focus on the realization of a university's role in local and regional development. Gunasekara (2006) investigates the role of universities in the development of regional innovation systems. The triple helix model of university, industry and government relations is used and applied to a comparative study of three noncore-metropolitan universities in Australia. But, the institutional interaction between industry, university and government has other forms than the "Triple-Helix Model." The paper of D'Costa (2006), which examines the Indian software industry, has a different approach:

"…the author argues that Bangalore's (and India's) information technology (IT) industry is predicated on an Indian business model which does not encourage thick institutional linkages such as those encapsulated by the triple helix model. Under this institutional arrangement there is cross-fertilization of new ideas and new modes of institutional interaction between industry, academia, and government D'Costa (2006)."

[7] The related documents are Etzkowitz and Leydesdorff (1995) and Leydesdorff and Etzkowitz (1996).

Benneworth (2006) poses the question whether universities in knowledge poor regions can improve their regional innovation systems, by working in the development of territorial production complexes which stimulate innovation based competitiveness in these places. For this purpose, Newcastle in the North East of England and Twente in the Netherlands are used as two examples of less successful regions. They focus on university spin off companies to explore the extent to which recent spin off companies, and the activities which coalesce around spin offs, are 'densifying' the regional innovation system, and making a place for those regions in the 'new knowledge economy'.

3. REGIONAL DISPARITIES AND CONVERGENCE IN TURKEY

Turkey comprises two dissimilar regional structures considering leading economic and social regional indicators: regional Gross Domestic Product (GDP) per head, employment level, energy consumption, and export level. They all show the dominant role of Istanbul, West Anatolia, East and West Marmara, Aegean, and partly Mediterranean region. Table-1 gives the rank of the first and last five NUTS[8] 2 level regions.[9] The west side includes the prosperous regions. Furthermore, these regions cover large metropolitan areas.

{Table-1 approximately here}

{Figure-1 approximately here}

Figure-1 shows the changes in per capita value added for 2004-2008. The per capita GDP values in West regions are above the average of Turkey.[10] Furthermore, almost all the manufacturing is located in the West side. The latest data shows that Istanbul and other western regions (the sum of TR10-TR62) account more than ¾ of the total manufacturing in the total value added (Table-2).

{Table-2 approximately here}

[8] Nomenclature of Territorial Units for Statistics
[9] These are ranked according to SEDI (Socio-Economic Development Indicators) (State Planning Organization, 2006)
[10] Turkish Statistical Institute (TURKSTAT) does not give the regional GDP values for the years after 2001.

The latest data shows that the share of labor force employed in non agricultural activities reaches 99 percent of total labor force in Istanbul (Table-3).

{Table-3 approximately here}

Table-4 displays the distribution of household incomes by quintiles ordered by income: The West regions are slightly equal in terms of income distribution considering the Gini coefficient; The East and the South-east regions have more inequality with only exception of the East Black Sea region (TR8).

{Table-4 approximately here}

Regional disparity is an important problem which has a very long history. The governments have focused on industrialization and rapid development targets in the early republican years to end this problem. This effort has continued over the three decades starting from just after the foundation of the Republic. The expansionary government policies were practiced in the 1950s: The new infrastructure investments were realized in leading cities and the government expenses increased in the rural areas of Turkey. Hence, there was no a specific regional policy, which intended to reduce disparities or improve welfare in unfavorable regions, from the beginning of the foundation of the Republic to the planning period (Dogruel, 2006). Specific regional policies have attempted to reduce regional disparities in the Five Year Plans starting from the 1960s. Although, most of the poor provinces are under preferential regional arrangements during the last half century, there is no convergence between regions. Altinbas et al. (2002) do not support the positive effect of preferential regional policies on the poor regions. The findings of Gezici and Hewings (2004) indicate a similar result.

Convergence hypothesis has been tested for the provinces and regions of Turkey in several studies. Most of the studies do not find evidence of convergence. The early studies of

regional disparities in Turkey are Tokgoz (1980) and Filiztekin (1998); and also Erk et al. (2000) for GAP Region. Dogruel and Dogruel (2003) analyze the period of 1987-1999 and found β convergence for unconditional and conditional models. It is also stated that poor provinces tend to converge faster than others. Conditional models that have manufacturing sector share as a variable also signals faster convergence. According to σ convergence analysis findings, convergence occurred only in developed-rich provinces.

Following Barro and Sala-i Martin (1995), Gezici and Hewings (2004) examine regional convergence and core-periphery relations in Turkey for the period 1980-97. They applied both σ and β convergence analyses and found no evidence for convergence across both provinces and the functional regions in Turkey. East and west regions of Turkey are also compared and it is found that disparities are still obvious between the two. The authors conclude that notwithstanding the policies for "Priority Provinces in Development", they do not grow faster than core-developed provinces. Moreover, the majority of them remained as poor regions with their neighbors.

Karaca (2004) measures σ and β convergence for the period 1975-2000, using the data of 67 provinces of Turkey. The author's main question is whether policies followed after 1960 in Turkey helped convergence between provinces and also between east and west regions. To reflect the structural differences between provinces, share of agricultural sector value added in the provinces' GDP is added as an explanatory variable. The findings indicate that there is no convergence but divergence between provinces. When structural differences are controlled, divergence disappears but still there is no evidence of convergence.

A recent paper by Aldan and Gaygisiz (2006) use β convergence both based on cross-sectional regressions and Markov chain analysis to test convergence hypothesis across the provinces in Turkey for 1987-2001 period. Results from both methodologies signal non-

existence of convergence. The authors also analyze the spatial spillovers in the growth process of provinces and find that such spillovers exist.

Erlat and Ozkan (2006) employ the time series approach to test for unconditional convergence of the geographical regions and provinces of Turkey. The approach involves testing if the squares of the differences of regional and provincial per capita incomes from a target income, (national and regional per capita incomes for the provinces) have significant negative average slopes when regressed on polynomials in time, and whether there are structural shifts in these slopes. The author concluded that evidence of conditional convergence may be obtained in an aggregate of national context (via panel unit root tests) but convergence results regarding individual provinces or regions may not provide support for this conclusion.

The issue of regional convergence in Turkey is also investigated by Yildirim and Ocal (2006) and Gezici and Hewings (2007). Recent literature on the convergence issue in Turkey has grown on some specific sub-topics: Kirdar and Saracoglu (2006) focused on the migration problem in the regional convergence in Turkey; Temel, Tansel and Gungor (2005) studied sectoral productivities; Karahasan (2010) analyzed the dynamics behind the regional firm formation; Karahasan and Bazo (2010) investigated human capital dispersion while Dogruel and Dogruel (2011) focused on both the interaction between openness and regional disparities, and changes in the technology level of the Turkish manufacturing sector at the regional level.

4. EMPIRICAL APPROACH AND RESULTS

The paper covers two periods from the last two decades: 1990-2000 and 2004-2008.[11] Turkish Statistical Institute (TURKSTAT) ceased to report regional data for NUTS 3 for later

[11] See Annex-1 and Annex-2 for the Regional Classification.

years.[12] Thus, as a proxy, per capita gross value added is used for 26 regions (NUTS 2). This data is estimated by TURKSTAT for 2004-2008, which is the coverage of the second period.

University expenditures are obtained from the General Directorate of Public Accounts[13] and airport data from the General Directorate of State Airports Authority database.[14] For the first period, although there are 81 provinces in the classification, only 67 are taken for the reasons stated in Dogruel and Dogruel (2003). That is, as the period includes the establishment of 14 new provinces, the values of these are added to the values of the provinces from which they were separated for simplicity but this does not cause a significant observation loss. Regions are classified as high income and low income provinces: The classification criterion is income-level (regional per capita) for the first period[15] and value-added (VA) for the second period.[16]

{Figure-2 approximately here}

As seen in Figure-2, there seems to be no clear relation between average growth rates of provinces (vertical axis) and the log of initial GDP per capita values (1990) when convergence is defined as in Barro and Sala-i Martin (1991b). Similar result holds for the second period when log of value added is used (Figure-3).

{Figure-3 approximately here}

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[12] The latest available year is 2001. Turkey experienced a financial crisis in 2001; therefore, we do not include that/this year in the analyses to avoid the possibility of bias in the regression analyses.

[13] http://www.bumko.gov.tr/TR/Genel/BelgeGoster.aspx?F6E10F8892433CFFA79D6F5E6C1B43FFA26CBFDF5F1B259F
http://www.bumko.gov.tr/TR/Genel/BelgeGoster.aspx?F6E10F8892433CFFAAF6AA849816B2EF270AD3B9EFAB8C39T
TURKSTAT publishes regional population only for 2007-2010. To find per capita university expenditures for 2004-2008, we calculate regional population using TURKSTAT data for regional gross value added and regional per capita gross value added. Calculated values match for 2007-2008 with reported values in TURKSTAT.

[14] http://www.dhmi.gov.tr/havaalanlari.aspx

[15] See Annex 3 for the list. This classification is based on Dogruel and Dogruel (2003)

[16] See Annex 4 for the list.

This paper employs a panel data approach to measure "β" convergence. The model is as follows:

$$logy_{it} = a_{it} + b \log y_{i,t-1} + c\ X_{it} \qquad (1)$$

Where $log\ y_{i,t}$ is the GDP per capita in province i at year t for the first period and per capita value added in region i at year t in the second period. In this approach, $\beta = -\ ln(b)$ gives the convergence coefficient. A significant positive value of the coefficient indicates convergence of regions, while a negative value shows divergence.

A set of control variables for government's economic environment augmenting activities is used. $U_{i,t}$ captures the knowledge impact of local state universities. It is a dummy variable equal to one beginning with the year of the establishment of the first university in the province for the first period of analysis. Since almost all NUTS2 regions have at least one university for the second period,[17] two proxies are used. The first proxy represents the number of universities in the region. The second proxy runs on zero (no universities) to four scale (more than three universities). [18] Both variables are insignificant; thus they are not reported in this study. It is possible that it may happen as a result of the fast increase of the number of universities: For example, the number of universities jumped from one in 2006 to three in 2007 in the TRB2 region. A corresponding increase in per capita value added in the same period cannot be observed.

$UB_{i,t}$ measures spending impact of universities. The total share of university expenditures in the related province's GDP is used for the first period and per capita university expenditures is used for the second period. For the latter period, normalizing the variable to population gives more significant results. $A_{i,t}$ is a dummy variable for government transport investment. It is equal to one beginning with the year of the establishment of the first airport in the

[17] The variable is zero only for TR82 (2004-2005) and TRC3 (2004-2006).
[18] For both variables, universities established in 2008 are excluded.

province. This variable is equal to one for almost all provinces for the second period.[19] Thus, the number of airports in the region is used as a proxy. Finally, $M_{i,t}$ is the share of manufacturing sector in GDP of province *i* for the first period and share of manufacturing sector value added in regional value added for the second period.

Table-5 displays the estimation results for convergence in the first period. In the first three columns (columns 1-3), the regression results capture the share of manufacturing sector in GDP and the knowledge impacts together. The following three columns (columns 4-6), give the regression results for the spending impacts of the universities and the access to air transport.

{Table-5 approximately here}

The regression results of Model-1 indicate that the coefficient of "*b*" is significant at 1% significance level in all models. The calculated "β" values show convergence in all models. The coefficient is larger for low-income provinces for all specifications, which points out that they converge more rapidly than do high-income provinces. A comparison of the calculated *"β"* values shows that for the low-income group, the regression results for the second specification (where spending effects are considered) is much larger than that of the first specification (which considers knowledge effects). This suggests that spending impacts are more important than knowledge effects for less developed regions.

In the columns 1-3, the share of manufacturing sector in GDP ($M_{i,t}$) is significant and positive in all fixed effects estimations supported by the Hausman Test. Furthermore, the dummy variable for the role of universities in convergence is positive and significant. This indicates positive spillover effects. The share of manufacturing sector in GDP has a positive effect in all type of regions in Model-1 (Column 1-3). According to the estimation results, although the coefficient of "UB_{it}" is positive in all regressions, university expenditures have a positive

[19] The variable is zero only for TR42 (2004-2008) and TR81 (2004-2006).

effect on convergence only in low-income provinces. The airport dummy has no effect on the high-income regions; it displays a positive effect only in the low-income regions. These results verify that the government initiative by investing in universities and airport transport trigger the development in the lagged regions before 2000.

The results show a slightly different picture when the second period is analyzed. The regression results in Table-6 also show that the coefficient of "*b*" is significant at 1% significance level in all models.

{Table-6 approximately here}

Again, the calculated "*β*" values are higher for low-income regions. However, in the 2004-2008 period, manufacturing sector has lost its significance for all income groups. But that does not mean that manufacturing is not important in both type regions. The fact is the distinctive nature of manufacturing sector has disappeared due to the changing structure of manufacturing sector in all regions. Before the 2000 period, one can observe the effects of the growing manufacturing sector in low income regions. The data in Figure-4 shows that share of manufacturing VA in region's VA changed significantly from the first period to second. The averages are 8.2% and 22.7% respectively. Nevertheless, it should not be neglected that the paper considers a more aggregated regional system (NUTS 2) in the second period; and, this may affect the manufacturing sector in the analyses. Furthermore, the definition differences of GDP and VA may affect the outcomes.

{Figure-4 approximately here}

The spending impacts of universities to convergence were observed in the low-income regions for all specifications. Moreover, the significance of the results does not change when the number of airports is added as a control variable. Airports have had a positive (but not significant) effect in the first period in the high-income regions. But now, this sign turned to

be negative and significant in the second period in the same regions. In the low-income regions, airport dummy had a positive (significant) effect on the convergence in the first period (before the 2000). And, contrary to the findings of the first period, the variable is no longer significant for low-income group in the second period. Probably, the disappearance of this effect in the second period is the outcome of using more aggregated data.

The paper also focuses on the effects of government initiative on the main sectors in the related regions. These sectors are manufacturing and services. Manufacturing is crucial in the regional growth, especially in the low income regions. Beyond the spending effect, the existence of a university directly may contribute to development of a region *via* manufacturing. At this point it is possible to emphasize the knowledge effect of universities and the possible improvements of labor skill in the region resulting from the existence of a university. The services sector makes an important contribution to the regional income especially in high-income provinces. Therefore, the paper examines the role of university expenditures and government's transport investments in the convergence of this sector. Table-7 and Table-8 report the results for manufacturing and services sectors for the first and second periods respectively given by the following specifications:

$$\log My_{it} = a_2 + b_2 log My_{it-1} + c_2 X_{it} \quad (2)$$

$$\log Sy_{it} = a_3 + b_3 log Sy_{it-1} + c_3 X_{it} \quad (3)$$

Where $log\ My_{i,t}$ is the manufacturing sector GDP per capita for the first period and manufacturing sector per capita value added for the second period. Similarly, $log\ Sy_{i,t}$ is the services sector GDP per capita and services sector per capita value added for the first and second periods respectively.

Table-7 shows that universities create positive externalities for the business environment in the manufacturing sector for the period 1990-2000. Particularly high-income provinces

benefit from knowledge-based cooperation. The results are not reported here, but spending impacts were insignificant for the first period for both income groups for this sector. University expenditures and access to air transport positively affect convergence in the services sector. Universities contribute to the development of the sector especially in high-income provinces through the spending effect. However, the airport contribution is more important in the low-income provinces.

{Table-7 approximately here}

The estimated coefficients in Table-8 indicate that spending impact of universities is important for convergence in manufacturing value added in low-income regions in the second period. The results are no longer significant for the variables used as proxies for knowledge effects, which are also not reported here. The loss of significance is due to aggregation of data for the second period.

{Table-8 approximately here}

There are a number of interesting findings with respect to service sector in Table-8. First, spending impacts are now insignificant for high-income regions, while they contribute to convergence for low-income regions. Second, the availability of airports is no longer an important factor in regional development for the low-income group. On the other hand, this creates divergence for the high-income group.[20] These findings stress the need for well structured transport investments in order to improve regional development.

The summary of the implications in this section are as follows: i) The role of universities in regional convergence in terms of contribution to the education of local employment is no longer significant in the high-income regions and still insignificant in the low-income

[20] In manufacturing sector specification, existence of airports is found negative but insignificant for high-income regions. Thus, the results are not reported here.

regions. The effect of new local universities may be observed in the future. However, this result also suggests that the local universities do not contribute to regional competitiveness through creating a learning economy anymore. To put it in another way, universities do not play an important role in the creation of the local human capital. This may be the outcome of the lack of government policies promoting university-local business collaboration at the regional level. Particularly for low-income regions, another factor may be that the graduated students from local universities do not settle down, which shows lack of opportunities in these regions. Both results stress the importance of knowledge and skills at the regional level and hence the need for effective regional policies in promoting regional growth. ii) The study shows that transport investments which were one of the driving forces for low-income regional development is no longer significant now. iii) Spending impact of universities has become an important factor in the development of manufacturing sector in the lagged regions. A similar result can be observed a for the service sector, although it is less significant than for manufacturing sector.

5. CONCLUSION

The overall results show that low income provinces converge faster than high-income provinces. The effects of universities are twofold: First, the local universities have positive spillover effects in all regions until 2000. This effect can be observed on both wealthy and poor regions. For the period 2004-2008, the Turkish government has established new universities in many regions. Thus, it is still too early to see the knowledge effects of these universities. Second, the expenditure effects of universities are restricted with the low-income provinces. From these outcomes, it is possible to say that the knowledge effect of universities is widespread while the effect of expenses is limited to the low-income regions (though the knowledge effects cannot be tested for the second period).

The paper also tests the importance of government's transport investment in promoting regional growth. The existence of an airport has a significant effect on low-income provinces for the first period. However, this effect cannot be observed in the second period.

Another contribution of this study is considering the impact of economics environment augmenting activities on manufacturing and services sectors separately. For the first period of the analysis, the paper finds that universities create positive externalities for the manufacturing sector. Particularly high-income provinces benefit from knowledge-based cooperation. University expenditures have impacts on the service sector in all regions. Therefore, through service sector university expenditures stimulate demand in all provinces, creating externalities. The same positive and significant effect for access to air transport can be observed only for low-income regions. For the second period, spending effects are a driving force for both sectors in low-income regions. However, there is no strong effect of airports on convergence anymore. This result may be due to limitations of using aggregated data.

Hence it is clear that there is a threshold for the regional income level: The demand effect resulting from university expenditures and the existence of an airport is more important in low-income provinces. The demand impact is weaker in high-income provinces; probably other factors play more significant role in those regions.

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TABLES

Table-1 : Selected Indicators for the First and Last Five NUTS 2 Level Regions Ranked According to Socio-Economic Development Index

REGIONS	SEDI (2003, within 26 regions)	GDP per capita (2001, TR=100)	Sectoral Structure of Employment			Urbanization Rate (%) (2000)	Net Migration Rate (per thousand) (2000)
			Share of Agr. Sector (%)	Share of Ind. Sector (%)	Share of Ser. Sector (%)		
TR10 (İstanbul)	1	143	0.7	37	62.4	90.7	46.1
TR51 (Ankara)	2	128	7.3	16	76.6	88.3	25.6
TR31 (İzmir)	3	150	18.1	27.7	54.2	81.1	39.9
TR41 (Bilecik, Bursa, Eskişehir)	4	117	18.3	37.8	43.8	76.4	38.7
TR42 (Bolu, Düzce, Kocaeli, Sakarya,Yalova)	5	191	20.4	26.8	52.8	57.2	-9.5
Turkey	-	100	29.5	19.4	51.1	64.9	-
TRA1 (Bayburt, Erzincan, Erzurum)	22	50	62	3.5	34.5	57.3	-43.5
TRC2 (Diyarbakır, Şanlıurfa)	23	54	38.1	5.7	56.1	59.1	-39.5
TRC3 (Batman, Mardin, Şırnak ,Siirt)	24	46	29.3	10	60.8	59.6	-46.8
TRA2 (Ağrı, Ardahan, Iğdır, Kars)	25	34	61.8	3.1	35.1	44.6	-57.3
TRB2 (Bitlis, Hakkari, Muş, Van)	26	35	48	6.3	45.8	49.3	-39.5

*Agriculture (Agr), Industrial (Ind), Services (Ser)
Source: State Planning Organization (2006).

Table-2: Share of regions by manufacturing industry value added (%), 2008

TR	**Türkiye**	**100**
TR10	İstanbul	27.1
TR21	Tekirdağ, Edirne, Kırklareli	3.6
TR22	Balıkesir, Çanakkale	1.8
TR31	İzmir	6.4
TR32	Aydın, Denizli, Muğla	2.9
TR33	Manisa, Afyon, Kütahya, Uşak	4.3
TR41	Bursa, Eskişehir, Bilecik	10.3
TR42	Kocaeli, Sakarya, Düzce, Bolu, Yalova	8.7
TR51	Ankara	7.8
TR52	Konya, Karaman	1.9
TR61	Antalya, Isparta, Burdur	2.1
TR62	Adana, Mersin	3.5
TR63	Hatay, Kahramanmaraş, Osmaniye	2.6
TR71	Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir	1.4
TR72	Kayseri, Sivas, Yozgat	2.6
TR81	Zonguldak, Karabük, Bartın	1.9
TR82	Kastamonu, Çankırı, Sinop	0.5
TR83	Samsun, Tokat, Çorum, Amasya	2.2
TR90	Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane	2.0
TRA1	Erzurum, Erzincan, Bayburt	0.5
TRA2	Ağrı, Kars, Iğdır, Ardahan	0.3
TRB1	Malatya, Elazığ, Bingöl, Tunceli	1.0
TRB2	Van, Muş, Bitlis, Hakkari	0.6
TRC1	Gaziantep, Adıyaman, Kilis	1.8
TRC2	Şanlıurfa, Diyarbakır	1.0
TRC3	Mardin, Batman, Şırnak, Siirt	1.3

Source: TURKSTAT

Table-3: Labor force status and economic activity (%), 2010 (15+ Age)

	Agr.*	Man.*	Ser.	Total
TR10 (İstanbul)	0.41	39.95	59.64	100
TR21 (Tekirdağ,Edirne,Kırklareli)	21.60	38.10	40.31	100
TR22 (Balıkesir,Çanakkale)	39.79	19.72	40.49	100
TR31 (İzmir)	11.74	30.47	57.79	100
TR32 (Aydın,Denizli,Muğla)	32.77	21.82	45.41	100
TR33 (Manisa,Afyon,Kütahya,Uşak)	39.90	25.63	34.48	100
TR41 (Bursa,Eskişehir,Bilecik)	11.05	43.95	45	100
TR42 (Kocaeli,Sakarya,Düzce,Bolu,Yalova)	19.85	34.09	46.06	100
TR51 (Ankara)	3.74	23.58	72.68	100
TR52 (Konya,Karaman)	35.15	24.63	40.35	100
TR61 (Antalya,Isparta,Burdur)	33.43	13.31	53.25	100
TR62 (Adana,Mersin)	30.26	19.61	50.21	100
TR63 (Hatay,Kahramanmaraş,Osmaniye)	35.42	24.79	39.67	100
TR71 (Kırıkkale,Aksaray,Niğde,Nevşehir)	39.12	15.16	45.49	100
TR72 (Kayseri, Sivas, Yozgat)	29.48	26.62	43.90	100
TR81 (Zonguldak, Karabük, Bartın)	40.74	23.28	36.24	100
TR82 (Kastamonu, Çankırı, Sinop)	48.78	15.33	35.89	100
TR83 (Samsun, Tokat, Çorum, Amasya)	45.61	15.10	39.29	100
TR90 (Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane)	54.68	12.63	32.59	100
TRA1 (Erzurum, Erzincan, Bayburt)	56.50	7.91	35.59	100
TRA2 (Ağrı, Kars, Iğdır, Ardahan)	58.22	9.21	32.57	100
TRB1 (Malatya, Elazığ, Bingöl, Tunceli)	42.89	15.67	41.44	100
TRB2 (Van, Muş, Bitlis, Hakkari)	38.31	13.49	47.95	100
TRC1 (Gaziantep, Adıyaman, Kilis)	24.43	32.25	43.32	100
TRC2 (Şanlıurfa, Diyarbakır)	27.89	17.23	54.88	100
TRC3 (Mardin, Batman, Şırnak, Siirt)	28.11	19.46	52.43	100

*Agriculture (Agr.), Manufacturing (Man.)
Source: TURKSTAT

Table-4: Distribution of household incomes by quintiles ordered by income, 2009

		Quintiles					
	Total	First 20%	Second 20%	Third 20%	Fourth 20%	Last 20 %	Gini
	2009	2009	2009	2009	2009	2009	2009
TURKEY	100	5.6	10.3	15.1	21.5	47.6	**0.415**
URBAN	100	6.0	10.7	15.0	21.1	47.3	**0.405**
RURAL	100	6.1	10.9	15.9	23.1	44.0	**0.380**
(TR1) Istanbul	100	7.6	11.7	15.5	20.5	44.8	**0.363**
(TR2) West Marmara	100	6.7	11.6	16.1	22.6	43.0	**0.361**
(TR3) Aegean	100	6.7	11.1	15.4	21.6	45.3	**0.381**
(TR4) East Marmara	100	7.3	11.8	15.7	20.5	44.8	**0.368**
(TR5) West Anatolia	100	6.2	10.2	14.6	21.3	47.6	**0.408**
(TR6) Mediterrannean	100	6.6	10.6	14.7	20.8	47.4	**0.403**
(TR7) Central Anatolia	100	6.9	10.7	15.0	20.8	46.6	**0.395**
(TR8) West Black Sea	100	6.5	11.5	15.8	21.0	45.3	**0.382**
(TR9) East Black Sea	100	7.0	12.0	16.0	21.4	43.5	**0.359**
(TRA) North East Anatolia	100	6.0	10.1	14.8	22.4	46.8	**0.407**
(TRB) Central East Anatolia	100	6.5	10.4	14.2	20.4	48.5	**0.415**
(TRC) South East Anatolia	100	6.0	10.5	14.6	21.3	47.7	**0.411**

Source: TURKSTAT

Table-5: Estimation results for Model 1 (1990-2000)

	1	2	3	4	5	6
Dependent variable: LogPCGDP	General	High Income	Low Income	General	High Income	Low Income
Constant	4.359*	2.992*	5.512*	5.041*	2.984*	10.159*
	(0.331)	(0.507)	(0.433)	(0.496)	(0.707)	(0.459)
Previous year	0 .679*	0.784*	0.587*	0.646*	0 .796*	0.261*
LogPCGDP	(0.024)	(0.036)	(0.032)	(0.035)	(0.049)	(0.034)
Share of manufacturing sector value added in GDP (M_{it})	0.007*	0.005**	0.008*			
	(0.001)	(0.002)	(0.002)			
University dummy (U_{it})	0.058*	0.050***	0 .067**			
	(0.021)	(0.026)	(0.034)			
University budget share (UB_{it})				0.013	0.021	0.029***
				(0.025)	(0.052)	(0.015)
Airport dummy (A_{it})				0.031	0.005	0.093*
				(0.034)	(0.078)	(0.021)
Observations	670	290	380	370	204	166
Number of provinces	67	29	38	39	22	17
R^2	0.700	0.872	0.880	0.920	0.860	0.565
β= - ln(b)	0.389	0.243	0.533	0.437	0.228	1.343

***10%, **5%, *1%, values in parentheses are standard errors.
Per capita Gross Domestic Product (PCGDP)
β= - ln(b)= -ln(coefficient of Previous year LogPCGDP)

Table-6: Estimation results for Model 1 (2004-2008)

	1	2	3	4	5	6
Dependent variable: LogPCVA	General	High Income	Low Income	General	High Income	Low Income
Constant	0.322*	0.18	0.367*	0.344*	0.373**	0.360*
	(0.096)	(0.214)	(0.096)	(0.097)	(0.195)	(0.097)
Previous year LogPCVA	0.759*	0.921*	0.720*	0.763*	0.933*	0.718*
	(0.042)	(0.092)	(0.043)	(0.042)	(0.080)	(0.044)
Share of manufacturing sector value added in (M_{it})	0.005	0.005	0.003	0.005	0.002	0.003
	(0.003)	(0.006)	(0.004)	(0.003)	(0.005)	(0.004)
Per capita university budget (UB_{it})	0.017*	-0.003	0.022*	0.017*	-0.001	0.022*
	(0.004)	(0.01)	(0.004)	(0.004)	(0.009)	(0.004)
Airport no (A_{it})				-0.021	-0.091*	0.015
				(0.017)	(0.029)	(0.018)
Observations	104	40	64	104	40	64
Number of provinces	26	10	16	26	10	16
R^2	0.968	0.943	0.903	0.963	0.869	0.897
β= - ln(b)	0.275	0.082	0.329	0.271	0.070	1.291

***10%, **5%, *1%, values in parentheses are standard errors.
Per capita value added (PCVA)
β= - ln(b)= -ln(coefficient of Previous year LogPCVA)

Table-7: Estimation results for Model 2 and 3 (1990-2000)

Dependent variable:	Log Manufacturing PCGDP			Log Service PCGDP		
	Model 2			Model 3		
	General	High Income	Low Income	General	High Income	Low Income
Constant	4.548*	3.700*	5.100*	5.069*	3.714*	10.115*
	(0.322)	(0.516)	(0.404)	(0.544)	(0.731)	(0.771)
Previous year Log Manufacturing PCGDP	0.606*	0.705*	0.528*			
	(0.027)	(0.041)	(0.037)			
Previous year Log ServicePCGDP				0.622*	0.725*	0.232*
				(0.040)	(0.053)	(0.058)
University dummy (U_{it})	0.062**	0.072***	0.030			
	(0.030)	(0.037)	(0.051)			
University budget share (UB_{it})				0.069*	11470**	0.037***
				(0.026)	(0.051)	(0.022)
Airport dummy (A_{it})				0.057***	0.043	0.132*
				(0.035)	(0.075)	(0.030)
Observations	737	319	418	351	193	158
Number of provinces	67	29	38	38	22	16
R^2	0.980	0.958	0.978	0.474	0.406	0.033
β= - ln(b)	0.501	0.350	0.639	0.475	0.322	1.461

***10%, **5%, *1%, values in parentheses are standard errors.

Per capita Gross Domestic Product (PCGDP)
β= - ln(b)= -ln(coefficient of Previous year Log Manufacturing PCGDP)

Table-8: Estimation results for Model 2 and 3 (2004-2008)

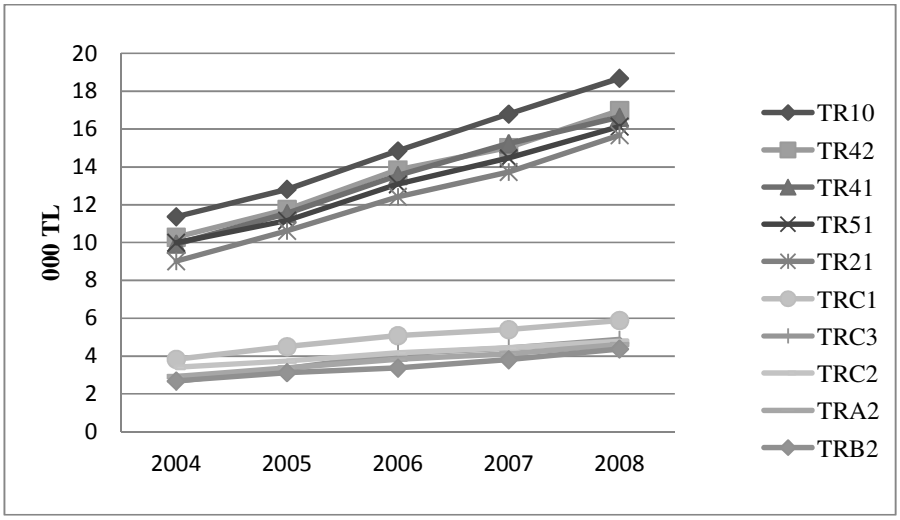
Dependent variable:	Log Manufacturing VA			Log Service VA		
	Model 2			Model 3		
	General	High Income	Low Income	General	High Income	Low Income
Constant	0.134*	0.282*	-0.008	0.27*	0.414*	0.18*
	(0 .032)	(0.067)	(0.041)	(0.035)	(0.062)	(0.036)
Previous year Log Manufacturing VA	0.619*	0.909*	0.56*			
	(0.057)	(0 .135)	(0.061)			
Previous year Log ServiceVA				0.889*	0.945*	0.87*
				(0.042)	(0.065)	(0.047)
Per capita university budget (*UBit*)	0.024*	-0.006	0.03*	0.007	-0.003	0.011**
	(0.006)	(0.014)	(0.007)	(0.005)	(0.008)	(0.005)
Airport no (A_{it})				-0.022	-0.101*	0.017
				(0.018)	(0.026)	(0.020)
Observations	104	40	64	104	40	64
Number of provinces	26	10	16	26	10	16
R^2	0.933	0.979	0.79	0.99	0.895	0.973
β= - ln(b)	0.480	0.095	0.580	0.118	0.057	0.139

***10%, **5%, *1%, values in parentheses are standard errors.

Per capita value added (PCVA)
β= - ln(b)= -ln(coefficient of Previous year Log Manufacturing VA)

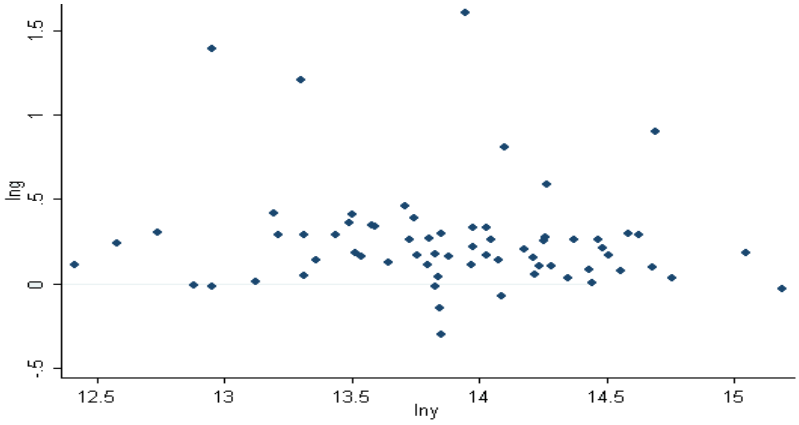
FIGURES

Figure-1: Per capita Value Added (000 TL) at the regional level NUTS2, 2004-2008



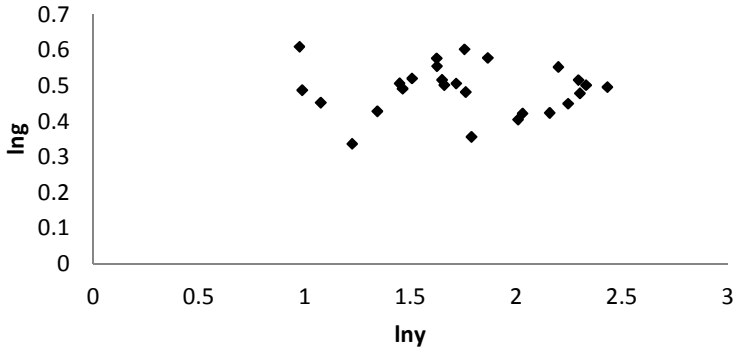
Source: TURKSTAT

Figure-2: Growth vs. Initial per capita Gross Domestic Product (1990-2000)*



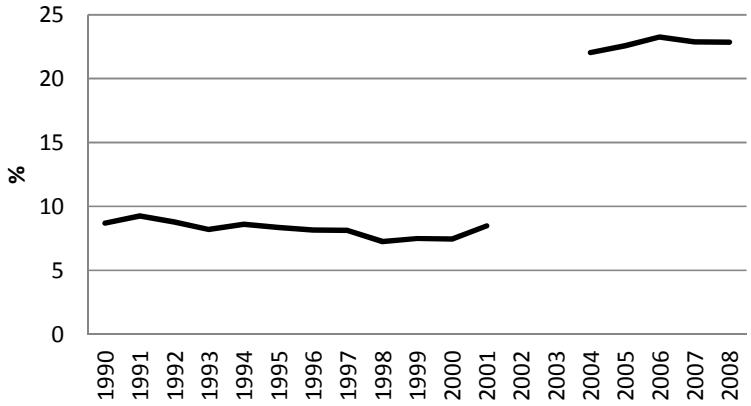
*lny is the ln (PCGDP in TL) from State Planning Organization, lng is ln (growth)

Figure-3: Growth vs. Initial per capita Gross Domestic Product (2004-2008)*



*lny is the ln (Per capita value added in 000TL)

Figure-4: Share of Manufacturing Value Added in Regional Valued Added (%) (low-income group)*



*Manufacturing share of Gross Domestic Product by statistical region level 3 (1990-2001) and gross value added by statistical region level 2 (2004-2008)