

POLICY RESEARCH WORKING PAPER

4725

Decentralization, Economic Development, and Growth in Turkish Provinces

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The World Bank
Sustainable Development Network
Social Development Department
September 2008



Abstract

There have been important developments in the decentralization of the government structure in Turkey since the early 1980s. This paper examines economic development and growth in Turkish provinces. Although there is a rich literature on the economic effects of government decentralization from both developed and developing countries, these effects have not been examined widely in the context of Turkish local governments. The authors first describe changes since the early 1980s and recent reform efforts. They then provide an empirical analysis of the effects of decentralization in

Turkish provinces using cross-sectional and panel data approaches. The panel dataset consists of 67 provinces from 1976 to 2001. The analysis examines whether variations in local decentralization across these provinces and across time have had a significant impact on economic development and growth in those provinces. The findings suggest a weak negative economic effect of decentralization through a number of municipalities per capita. However, the findings do not show any significant impact from the creation of new provinces by separation from the existing ones.

This paper—a product of the Social Development Department, Sustainable Development Network—is part of a larger effort in the department to study local governance systems and decentralization in the client countries. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The author may be contacted at syilmaz@worldbank.org.

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JEL classification: H77, H87, N45, O53

Key words: Decentralization; intergovernmental relations; Turkish provincial cities; economic development and growth

The authors thank Ayse Guner, Bilin Neyapti, Mediha Agar and Mark Thomas for helpful comments and suggestions, and Dilek Uz for excellent research assistance. The findings, interpretations, and conclusions are entirely those of authors, and do not represent the views of the World Bank, its executive directors, or the countries they represent. Corresponding author: Serdar Yilmaz.

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1. Introduction

Decentralization efforts in developing countries in recent decades have led to an extensive literature on the causes and consequences of both centralization and decentralization. While recent studies followed a comparative perspective and showed similarities and differences between the decentralization efforts in a variety of developing countries, countries in the Middle East and North Africa (MENA) region and Turkey are largely left out of those comparisons (Bardhan and Mookherjee, 2006).

Among the developing countries that have liberalized their economies, Turkey has gone through significant decentralization in its government structure since the early 1980s. As the ongoing political and economic reforms in Turkey enter a new era, the country is preparing to deal with its prospective entry into the European Union (EU). Joining the EU is likely to place heightened demands on the public administration system of Turkey. For Turkey to meet European Union (EU) standards of service delivery there is an urgent need for investment in local infrastructure systems. However, it was impossible for local governments to meet the challenge with the archaic local government sector laws and regulations. Recognizing the need for reforming the local government sector, the government has announced an ambitious reform plan and prepared various legislations.

In this paper, we examine economic development and growth in Turkish provinces. While there is a rich literature on the economic effects of government decentralization from both developed and developing countries, these effects have not been examined widely within the context of Turkish local governments. We first give an overview of the local government structure and recent reform efforts. We then provide an

empirical analysis of the effects of decentralization on economic development and growth in Turkish provinces using cross-sectional and panel data approaches. Our panel dataset consists of 67 provinces over a period from 1976 to 2001. We examine specifically if variations in local decentralization across these provinces and across time have had a significant impact on economic development and growth. We find mixed results from our analysis of decentralization in Turkish provinces. First, creation of new provinces by separation from existing provinces seems to have had no significant impact on development or growth in those existing provinces. On the other hand, decentralization through increase in the number of local governments per capita seems to have had a negative effect on the level economic development.

2. Literature on Decentralization

Decentralization is seen as an important avenue for efficiency gains by enabling a direct link between local provision of services and local tastes (Oates 1972, 1993). It is then expected that decentralization helps promote economic growth. Numerous studies examined empirically the relationship between decentralization and economic growth.¹ Among these Davoodi and Zou (1998) used a panel of 46 developed and developing countries for the period 1970-1985 and found a negative relationship between fiscal decentralization and growth in developing countries and no significant relationship for the developed countries. China has been a popular case study due to its sweeping fiscal reforms to decentralize since late 1970s. Zhang and Zou (1998) examined a panel of 28 Chinese provinces during the period 1980-1992 and found a negative relationship

¹ Other aspects of fiscal decentralization were also examined. See, for example, Oates (1985) for the impact of fiscal decentralization on public sector size, De Mello (2000) for a cross-country study on fiscal decentralization and fiscal balances, and Neyapti (2006) for a recent empirical study on revenue decentralization and inequality.

between decentralization and growth. Xie, Zou and Davoodi (1999) found a similar relationship for the U.S. after examining time series data from 1948 to 1994. Other studies conflicted these findings by showing evidence of a positive relationship between fiscal decentralization and economic growth. For example, Lin and Liu (2000) found evidence of a positive relationship for the same Chinese provinces used by Zhang and Zou (1998) after taking into account other concurrent reforms. In a pioneering study on fiscal decentralization in Turkey, Neyapti (2005) examined the links between fiscal decentralization and socio-economic indicators in Turkish provinces. Overall, she found a favorable impact of fiscal decentralization, with a positive relationship with the level and growth rate of output. Neyapti's empirical analysis was constrained, however, by data limitations regarding the fiscal decentralization data that only allowed cross-sectional analyses for the years 1995 and 1998.

In another study, Akai and Sakata (2002) pointed to the importance of controlling for historical or cultural differences between observations and using a period of relatively lower growth in a decentralization study. To improve on the data problems of other studies, they used data from 50 U.S. states for the period 1992-1996. They found evidence of positive contribution of fiscal decentralization to economic growth. In a recent study, Stansel (2005) extended the local government empirical literature by examining the link between local decentralization and local economic growth using a new dataset of 314 U.S. metropolitan statistical areas. He found a negative and significant relationship between the central city share of metro population and population and real per capita income growth and a positive and significant relationship between the number of county governments per resident and population and real per capita income

growth. Hence, his study shows evidence of a positive relationship between local decentralization and metropolitan statistical area economic growth. After reviewing a variety of past studies on decentralization and economic growth, Martinez-Vazquez and McNab (2003) concluded that there is no empirical consensus on the relationship between decentralization and economic growth.

3. Recent Decentralization Efforts in Turkey

Historically, the Turkish public administration system has had a very strong centralist orientation. Local governments have long been subjected to a strong administrative and financial tutelage. This emphasis on strong central administration was inherited from the Ottoman Empire and has been reinforced by the Turkish Republic as part of the national modernization process.² However, recognizing the increasing demands from citizens for better service delivery and to increase its chances for opening of European Union membership negotiations, the Turkish government announced an ambitious public sector reform package in 2002. Decentralization of decision-making power and development of modern local government system was the fundamental component of the government's reform plan. Accordingly, the government has proposed and the Parliament has enacted several local government reform laws updating outdated local government laws, some of which were from the Ottoman Empire times.

The local government system in Turkey has been organized as special provincial administrations (SPA), districts, villages, metropolitan municipalities and municipalities. SPA is an "intermediate-level" local government unit operating at provincial level. SPAs provide services to both urban and rural areas. The main responsibility areas of SPAs

² Bayraktar (2007) provides an excellent review of the evolution of the Turkish local government system from Ottoman Empire times to the recent changes under the Turkish Republic.

include education, health, police, infrastructure, agriculture, rural services, industry and trade. They also have the responsibility for providing environmental development plan, roads, water, sewage, solid waste, environment, emergency, culture, tourism, youth and sports, forestation, parks and recreation services outside of municipal boundaries. Currently, there are 81 provinces covering the whole territory of the country. For administrative purposes, provinces are subdivided into districts (ilce), which in turn are divided into communes (villages).

The number of provinces has changed several times in the past. Table 1 presents those changes since the establishment of the Turkish Republic in 1923. The number has stayed stable during the period between 1957 and 1989. However, recently there has been a rapid increase in the number of provinces. Between 1989 and 1999, 14 new provinces were established. Establishing a new province is a costly process for the government—it requires creating a new administrative structure with all line ministries' presence.

In 2005, the Parliament has enacted a new legislation to reform SPA system, which was previously regulated by an Ottoman Empire law dating back to 1913. Prior to this new Special Administration Law no.5302 of 2005, SPAs were strictly deconcentrated local government units representing the central government in provinces. With this new legislation the government aims to strengthen the special provincial administrations by assigning them various local services provided by the central government organizations and restructuring them along the democratic principles.

The second type of local governments is a municipality. Municipalities are the decentralized local government units. They provide municipal services only in urban areas within provincial boundaries. The number of municipalities has increased

significantly in the last two decades (see Table 2). At the present time, there are 3,225 municipalities of which 16 are metropolitan municipalities, 100 are district municipalities in metropolitan municipality jurisdictions, 283 are district level first degree municipalities, 65 are provincial municipalities, 750 are district municipalities and 2,011 are township municipalities. However, municipal population is concentrated in several large cities, leaving a large majority of municipalities with very small populations (see Table 3). Currently, more than half of the population (53.6 percent) lives in 122 municipalities. More than 2,000 municipalities, which are more than 60 percent in terms of number of municipalities, have population less than 5,000. In other words, while the number of municipalities with less than 5,000 people makes up 62 percent of all municipalities; their population totals only 11 percent of the total population. The average population settled in municipalities is 16,643.

With the increase of the number of municipalities over time, their size decreased and created issues of economies of scale and scope in service delivery. According to Keles, politicians encouraged establishment of new municipalities because of central government grants to localities (Keles 2000). Ruling parties at the center were reluctant to enforce minimum population criterion, which was set to 2,000, in fear of losing popular support in those localities. In 2008, the Parliament has approved a new law (Law No. 5747) reducing the number of municipalities by changing the status of small municipalities that do not meet the minimum population criterion of 2,000 per village, abolishing 283 first-degree municipalities and amalgamating 25 municipalities with nearby municipalities. This change, which will be effective after the 2009 elections, effectively reduces the number of municipalities to 2,105 from 3,225. With this change,

there will be 16 metropolitan municipalities, 142 district municipalities in metropolitan municipality jurisdictions, 65 provincial municipalities, 750 district municipalities and 1,132 township municipalities.

Municipalities are not distributed across the country uniformly. The distribution of number of municipalities across regions is skewed toward the west, reflecting migration trends in the country. Municipalities by population and region are depicted in Table 4. Five population categories are: (1) population less than 5,000; (2) population 5,000-20,000; (3) population 20,000-50,000; (4) population 50,000-100,000; and (5) population more than 100,000; and metropolitan municipalities. Some of the stylized facts are: 41.4% of the municipal population lives in metropolitan municipalities. 71% of the municipalities in Central Anatolia and 49% of the municipalities in Southwest Anatolia have populations less than 5,000. Municipalities with more than 100,000 people are only 3.3% of the municipality number. Marmara region is the only region with more than 35 percent of municipalities with population more than 100,000. The metropolitan municipal population in Marmara region makes up 67.7% of all municipal population; furthermore its share in the region's total population is 83.1%.

As part of the government's reform efforts, the Parliament enacted the Municipality Law no. 5393 of 2005. Prior to this legislation, municipal sector was regulated by the Municipality Law no.1580 of 1930. This new legislation reflected service delivery realities over the past 75 years. An important change with the new municipal sector law is the increase in the population threshold to establish a municipality to 5,000 from 2,000. The reason for this change is to reap the benefits of economies of scale in service delivery. However, this new increased threshold applies to establishment of new

municipalities; it does not apply to existing municipalities that are above the minimum threshold of 2,000 (the minimum population criterion under the previous legislation).

In Turkey, there is a two-tier municipal system in 16 large cities. In these cities, metropolitan municipalities were established in 1984 because of increasing demand for urban service due to high urbanization rates. As part of its reform efforts, the government drafted a new law and submitted to the Parliament. The Metropolitan Municipality Law no.5216 was enacted and approved by the Parliament in 2004. Metropolitan Municipality Law no. 5216 preserved this two-tier system in order to reap the advantages of having large structures in the city management (metropolitan municipality) and benefits of participation and dynamism of small structures (district municipalities under a metropolitan municipality). An important change with the new Metropolitan Municipality law is setting of minimum population criterion as 750,000 to establish a new metropolitan municipality. In 1984 law establishment of a new metropolitan municipality was left to the discretion of the central government.

In July 2008, the Turkish Parliament approved another legislation changing criteria for the allocation of intergovernmental transfer shares across special provincial administrations and municipalities (Law no. 5779). Prior to this legislation, intergovernmental transfer system was based on population for both special provincial administrations and municipalities. This legislation changed the transfer formula for special provincial administrations by reducing the weight for population to 50 percent and adding other criteria: geographic size (10%), number of villages (10%), rural population (15%) and development index (15%). For municipalities it reduced the weight

for population to 80 percent and added a development index (20%) to the transfer formula.

4. Data and Empirical Approach

As noted by Ebel and Yilmaz (2003), there are serious problems with the measurement of decentralization, due mainly to imperfect data generation in developing countries. Measuring decentralization at the province level is even more problematic than it is at the national level. One way to overcome data issues is to look at differences in the number of local governments across provinces and also across time. Recent studies from the U.S. used this type of decentralization measure to examine the economic impacts of decentralization (Zax, 1989; Stansel, 2005; Hammond and Tosun, 2006). Zax (1989) used two measures, number of local governments per capita and number of local governments per square mile of land. While the former is used as a measure of the degree of scale economies, the latter can be seen as a measure of competition between local governments in the Tiebout sense.³ Hammond and Tosun (2006) followed the empirical approach by Zax in their analysis of decentralization in the metropolitan and non-metropolitan counties in the U.S.

We also follow Zax and use number of local governments per capita and number of local governments per square mile of land as main decentralization variables. Hence our decentralization variables are more local political fragmentation indicators than fiscal decentralization measures. We should note, however, that the two are highly correlated and the literature used both as measures of decentralization. We also examine creation of new provinces by separation from existing provinces starting in 1989 using a dummy

³ As Zax (1989: 563) explains “if scale economies exist, the size of the local public sector should be less where each government serves more citizens.” For the second measure he notes “[t]he number of governments in an area of fixed geographic size indicates the ease of moving between jurisdictions.”

variable (Separation) that is equal to one for the years after separation and zero before separation. We would expect separation to have a positive economic impact on the existing original provinces if decentralization is thought to enhance efficiency in public service provision.

We conduct our empirical analysis in two parts. First, we examine recent decentralization through changes in number of local governments (per capita and per square kilometer) by including observations from 1976 to 2001. However, we limit our analysis to the original 67 provinces to maintain data consistency throughout the entire period of study. To understand the effect of local decentralization on economic activity and development, we regress provincial gross domestic product per and annual growth rate in provincial GDP per capita on a number of explanatory variables including a dummy variable indicating creation of new provinces by separation from existing ones (Separation), number of municipalities (per capita and square kilometer of land), land area, total number of vehicles, and province and time fixed effects. The main data source for these variables is the Turkish Statistical Institute (TUIK).⁴

In the second part of the empirical analysis, we examine cross-sectional variation in decentralization across the current total of 81 Turkish provinces.⁵ We picked 2000 as the year of analysis, which is the most recent data year before the 2001 financial crisis in Turkey. In these regressions, we also use “provincial development index” as another

⁴ We use provincial GDP data of 2000 as the basis of analysis. However, TURKSTAT introduced a fourth revision to the GDP series and updated the base year to 1998 from 1987. Revised provincial GDP data do not exist yet. Since our analysis covers the period between 1976 and 2001 we believe that this change has a limited impact on the results.

⁵ From 1989 to 1999 fourteen new provinces are created by separation from other existing provinces (see Table 1).

dependent variable.⁶ We add share of urban population as another explanatory variable. On the other hand, we cannot use provincial and time fixed effects due to cross-sectional data. Instead, we use regional dummies to control for specific regional effects. Again, our main data source is TUIK. Provincial development index is provided by the Turkish State Planning Organization (DPT).

5. Empirical Method and Results

Methodology

We use regression analysis to estimate the effect of local government decentralization on economic development and growth in Turkish provinces. The data are a panel of 1,724 observations that include 67 provinces for the years 1976 through 2001. Summary statistics of regression variables for the panel regressions are provided in Table 5. Two conventional approaches for estimating panel data are the fixed-effects and random-effects procedures. However, if the individual province fixed-effects are correlated with other exogenous variables, the random-effects estimation procedure yields inconsistent estimates. A fixed-effects model has the advantage of removing the bias from the estimation caused by a possible correlation between explanatory variables and time-invariant province specific effects.

For the cross-sectional regression analysis with the current number of 81 provinces, we also control for the spatial correlation in economic activity between contiguous provinces. Summary statistics for these regressions are shown in Table 6. First introduced by Cliff and Ord (1981) and Anselin (1988), models of spatial dependence account for any direct influence of spatial neighbors, spillover effects, and

⁶ Provincial development index is developed by the State Planning Organization. More about the index see Dincer, Ozaslan and Kavasoglu (2003).

externalities generated between cross-sectional observations (in this research the unit of observation is province). Failing to address spatial dependence may lead to biased, inefficient, and/or inconsistent coefficient estimates. In order to test for spatial autocorrelation in the data, we conducted diagnostic tests using data for a cross-section of 81 provinces in 2000. For this, we created a spatial weights matrix that shows the presence of potential spatial interaction between neighboring provinces. We ran diagnostic tests for both the spatial error and spatial lag models (Anselin *et al.*, 1996). In a spatial error model there is an autoregressive process in the error term, whereas a spatial lag model assumes a spatially lagged dependent variable. Lagrange multiplier test statistics are used to test the null hypothesis that autoregressive parameters are equal to zero.⁷ The null hypothesis is rejected, indicating the presence of spatial autocorrelation, particularly in the case of spatial lag model.

Spatial dependence is caused by the existence of spillover effects between units of observation (provinces) and the presence of a direct influence from activity in one province on neighboring provinces. In this case, it may be that economic activity measured by GDP in one province affect GDP per capita in neighboring provinces. We therefore run separate regressions using the spatial lag model.

Results

Empirical results are provided in Tables 7 and 8. We start in Table 7 with the panel regression results. Results in the first three columns are from regressions where log of GDP per capita is used as the dependent variable. Results in the next three columns

⁷ Spatial data analysis commands developed by Pisati (2001) for STATA are used to conduct the spatial autocorrelation diagnostic tests. Diagnostic test output presents Moran's I, Lagrange multiplier and Robust Lagrange Multiplier test statistics for the spatial error model and Lagrange multiplier and Robust Lagrange Multiplier test statistics for the spatial lag model. See Anselin *et al.* (1996) for a detailed explanation of these tests.

come from regressions with growth rate in GDP per capita as the dependent variable. In the first column, we show the results where decentralization through creation of new provinces by separation from existing provinces is examined through a dummy variable called “Separation” where Separation is 1 for the years after separation in the provinces that experienced separation and 0 before. We model this regression using the fixed effects two-stage least squares procedure since separation is likely an endogenous phenomenon. Using the Metrocity dummy and midyear population as instruments, we find that while Separation has a positive coefficient, it is not statistically significant. In the second column, we replaced Separation with the log of number of municipalities per capita as our key decentralization variable. Here, we find that decentralization is negatively and statistically significantly associated with GDP per capita. This would support the view that decentralization limits economic benefits from economies of scale in public service provision. We get a similar result in column (3) when we replace log of municipalities per capita with log of municipalities per square kilometer of land. Hence we find either no or negative effect of decentralization on level of GDP per capita. Economic growth regressions in the remaining columns in Table 6 show negative coefficients for our decentralization variables but none of these are statistically significant. Hence we cannot confirm any significant effect of decentralization on the economic growth rates in the provinces. Among other control variables in the regressions, we find that total vehicles per capita has positive and significant association with GDP per capita and GDP growth in almost all regressions. The Metrocity dummy also has a positive and significant coefficient in two of the GDP per capita regressions.

We now turn to cross-sectional spatial regressions in Table 8. In the first two columns, we examine the relationship between our decentralization variables and the level of GDP per capita, similar to our approach in Table 7. One difference is we focus on number of municipalities per capita and per square kilometer of land. While we get a negative coefficient for the regression with number of municipalities per capita in column (1), the coefficient for the number of municipalities per square kilometer turns positive in column (2). In both cases, however, we lose statistical significance. When we use provincial development index instead of GDP per capita, we find significant results for the decentralization variables. In column (3) we find that there is a negative and significant association between the number of municipalities per capita and the development index, similar to what we found in column (2) of Table 7. In column (4) there is now a positive and significant association between the number of municipalities per square kilometer and the development index. This may indicate that while existence of scale economies produce negative development effects from decentralization, decentralization produces a counteracting positive impact through greater degree of competition and ease of inter-jurisdictional mobility. Among the control variables, total vehicles per capita and share of urban population have consistently positive and significant associations with GDP per capita or development index in all regressions. Being a metrocity seems to have a positive and significant association with economic development in the last two regressions. Results for the regional dummies show that Marmara Region, in particular, has a significantly higher development level compared to the omitted region dummy for the Central Anatolia Region.

6. Summary and Conclusions

It is important to examine the impact of past decentralization in Turkey as the country is going through significant reforms, including public administration reform, in the EU accession process. More decentralization is expected in Turkey as the Parliament has recently approved a new law (Law No. 5747) that could substantially reduce the number of municipalities in provinces starting in 2009. In the midst of these reform efforts, we find mixed results in our analysis of past decentralization in Turkish provinces. First, creation of new provinces by separation from existing provinces seems to have had no significant impact on development or growth in those existing provinces. On the other hand, decentralization through increase in the number of local governments per capita seems to have had a negative effect on at least the level economic development. The other decentralization measure, number of local government per square kilometer of province land gives us different results in different regressions. The cross-sectional regressions that used more recent data show that enhanced competition through more municipalities per square kilometer produced favorable results in terms of economic development levels across provinces.

The evidence that there is a negative effect of decentralization through number of municipalities per capita may be pointing to the importance of economies of scale in public service provision. At the same time, there seems to be weak evidence that Tiebout style local government competition may have enhanced economic efficiency in Turkish provinces, which requires further study.

As a future extension, one can expand on Neyapti (2005) and seek panel data for the period from 1980 to 2000 to examine the impact of extensive “fiscal decentralization”

within provinces during that period, in addition to local government decentralization through political fragmentation. Additionally, it may be worth looking at the impact of different local government types such as larger vs. smaller municipalities in terms of population size, and also different local government units such as districts (ilce) and villages (koy).

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Table 1. Number of Provinces by Year

Year	Number	Names of new provinces	Year	Number	Names of new provinces
1924	74	Artvin, Kars, Ardahan	1957	67	Kirsehir
1926	63	Uskudar, Beyoglu, Catalca, Gelibolu, Ardahan, Mus, Dersim, Genc, Siverek, Ergani and Kozan were downgraded to district.	1989	71	Aksaray, Bayburt, Karaman, Kirikkale
1929	63	Mus became a province; Bitlis was downgraded to district.	1990	73	Batman, Sirnak
1933	57	Aksaray, Cebelibereket, Artvin, Sebinkarahisar, Hakkari were downgraded to district. Mersin and Silifke were merged to create Icel province.	1991	74	Bartın
1936	62	Artvin, Hakkari, Bitlis, Bingol, Tunceli	1992	76	Ardahan, Iğdir
1939	63	Hatay	1995	79	Yalova, Kilis, Karabuk
1953	63	Usak became a province; Kirsehir was downgraded to district.	1996	80	Osmaniye
1954	66	Adiyaman, Sakarya, Nevsehir	1999	81	Duzce

Source: Kilinc, Gokcen and Gulersoy, Nuran Z. 2007.

Table 2. Number of Municipalities by Year

Year	Number	Year	Number
1923	421	1980	1727
1935	505	1985	1703
1945	583	1988	1925
1950	628	1992	2270
1955	809	1993	2553
1960	995	1994	2715
1965	1062	1997	2801
1970	1303	2000	3225
1975	1654		

Source: Keles. 2000. p.221.

Table 3. Municipalities by Population

Population	Number	% of Municipalities	% of Population
0-2000	353	10.9	1.1
2000-5000	1.652	51.2	9.6
5000-10000	559	17.3	7.0
10000-20000	274	8.5	7.1
20000-50000	182	5.6	10.7
50000-100000	83	2.6	10.8
+100000	122	3.8	53.6

Source: T.C. Basbakanlik. 2005. p. 47.

Table 4. Municipalities by Region and Population Size, 2000

Regions	1	2	3	4	5	Metro Mun.	Total
Marmara	207	108	46	13	38	4	416
Black Sea	341	144	35	13	8	1	542
Mediterranean	364	147	24	10	16	3	462
Aegean	421	125	24	12	2	1	595
East Anatolia	155	91	17	12	6	1	282
Southwest Anatolia	45	64	10	14	10	2	195
Central Anatolia	522	154	26	9	18	4	733
Total	2,005	833	182	83	106	16	3,225

Source: T.C. Basbakanlik. 2005. p. 48.

(1) Population less than 5,000 (2) Population between 5,000 and 20,000 (3) Population between 20,000 and 50,000 (4) Population between 50,000 and 100,000 (5) Population more than 100,000

Table 5. Summary Statistics for the Panel Regressions

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
GDP per capita in province	1,742	1,152,298	652,109	252,450	4,711,093
Growth rate in GDP per capita	1,675	1.532449	9.372217	-37.7538	88.41553
Metrocity dummy	1,742	0.102756	0.303726	0	1
Separation dummy	1,742	0.056257	0.230484	0	1
Midyear population	1,742	792,056.2	955,576.4	91,309	1.02E+07
Land area of province in square Km.	1,742	11,401.99	7,234.895	3,310	49,683
Number of Municipalities per capita	1,742	0.0000508	0.0000271	0.0000028	0.000152
Number of municipalities per square km.	1,742	0.003224	0.002325	0.000435	0.016509
Number of vehicles per capita	1,742	0.035108	0.028422	0.001803	0.198009

Table 6. Summary Statistics for the Cross-Sectional Spatial Regressions

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
GDP per capita in province	81	1,411,365	842,235.1	315,760.8	4,331,186
Provincial development index	81	-0.000000244	1.000001	-1.43956	4.80772
Land area of province in square Km.	81	9,673.03	6,580.966	850.46	40,814
Metrocity dummy	81	0.1851852	0.390868	0	1
Share of urban population	81	0.5555888	0.1192445	0.2606283	0.9102262
Number of Municipalities per capita	81	0.0000631	0.0000309	7.39E-06	0.0001494
Number of municipalities per square km.	81	0.0046132	0.0030751	0.0008702	0.0165094
Number of vehicles per capita	81	0.0823766	0.0479214	0.0112942	0.203185
<u>Regional dummies:</u>					
Mediterranean	81	0.0987654	0.3002057	0	1
Eastern Anatolia	81	0.1851852	0.390868	0	1
Aegean	81	0.0987654	0.3002057	0	1
Southeast Anatolia	81	0.0987654	0.3002057	0	1
Central Anatolia	81	0.1604938	0.3693504	0	1
Black Sea	81	0.2222222	0.41833	0	1
Marmara	81	0.1358025	0.3447132	0	1

Table 7. Panel Data Regressions

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:	Log of GDP Per Capita	Log of GDP Per Capita	Log of GDP Per Capita	Growth Rate in GDP Per Capita	Growth Rate in GDP Per Capita	Growth Rate in GDP Per Capita
Log of area size in SqKm	0.516 (0.327)	0.045 (0.031)		-26.874 (21.054)	-8.812 (2.140)***	
Metrocity dummy	-0.019 (0.035)	0.026 (0.016)*	0.034 (0.016)**	2.051 (2.247)	0.362 (1.084)	0.398 (1.100)
Separation dummy	0.359 (0.245)			-13.542 (15.729)		
Log of total vehicles per capita	0.213 (0.031)***	0.265 (0.025)***	0.216 (0.025)***	3.648 (2.076)*	2.835 (1.767)	3.705 (1.751)**
Log of number of municipalities per capita		-0.113 (0.022)***			-0.571 (1.497)	
Log of number of municipalities per square km			-0.060 (0.021)***			-1.262 (1.469)
Constant	9.794 (3.074)***	13.324 (0.355)***	14.277 (0.193)***	252.872 (197.697)	78.014 (24.041)***	-1.568 (10.522)
Observations	1742	1742	1742	1675	1675	1675
Number of provinces	67	67	67	67	67	67
Within R-squared	0.48	0.53	0.52	0.12	0.15	0.14

Standard errors in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 8. Cross-sectional Spatial Lag Regressions

Dependent Variable:	(1) Log of GDP Per Capita	(2) Log of GDP Per Capita	(3) Provincial Development Index	(4) Provincial Development Index
Log of share of Urban population	0.626 (0.189)***	0.671 (0.175)***	0.765 (0.278)***	1.376 (0.300)***
Log of area size in SqKm	-0.061 (0.058)		-0.120 (0.086)	
Metrocity Dummy	-0.075 (0.108)	-0.106 (0.092)	0.418 (0.158)***	0.670 (0.159)***
Log of number of municipalities per capita	-0.022 (0.078)		-0.652 (0.116)***	
Log of number of municipalities per square km		0.001 (0.059)		0.183 (0.102)*
Log of total vehicles per capita	0.382 (0.072)***	0.367 (0.070)***	0.524 (0.104)***	0.442 (0.119)***
<u>Regional Dummies:</u>				
Mediterranean	-0.038 (0.122)	-0.017 (0.121)	-0.303 (0.181)*	-0.138 (0.208)
Eastern Anatolia	-0.264 (0.154)*	-0.223 (0.145)	-0.352 (0.221)	0.233 (0.242)
Aegean	0.134 (0.129)	0.132 (0.130)	0.170 (0.189)	0.237 (0.222)
Southeast Anatolia	0.014 (0.156)	0.073 (0.137)	-0.859 (0.238)***	-0.218 (0.241)
Black Sea	0.098 (0.119)	0.155 (0.103)	-0.210 (0.186)	0.228 (0.183)
Marmara	0.324 (0.130)**	0.348 (0.126)***	0.226 (0.195)	0.530 (0.216)**
Constant	12.012 (2.019)***	11.105 (1.682)***	-3.332 (1.418)**	2.772 (0.683)***
Observations	81	81	81	81

Standard errors in parentheses. Dummy for Central Anatolia Region is omitted to avoid the dummy variable trap.

* significant at 10%; ** significant at 5%; *** significant at 1%