Market Potential and Regional Disparities in Turkey

< Preliminary draft >

B. Can KARAHASAN[*], Fatma DOGRUEL[**] and A. Suut DOGRUEL[***]

Abstract

Regional disparity is one of the important characteristics of Turkish economy. The paper focuses on the explanatory power of market potential on the regional differences in Turkey. Regional divergences in wages and employment are used as the proxies for regional differences. Empirical results reveal that, under various specifications, variation in market potential is an important determinant of regional differences.

JEL codes:
R12: Size and Spatial Distributions of Regional Economic Activity
J31: Wage Level and Structure; Wage Differentials
O18: Regional, Urban, and Rural Analyses; Transportation

Keywords:
Economic geography; market potential; market access; regional disparities; wage equation; Turkey

[*] İstanbul Bilgi University.
[**] Marmara University
[***] Marmara University

1. INTRODUCTION

Regional disparities have never disappeared over the decades in Turkey. Historically economic backwardness has been the main characteristic of the eastern regions over the century. Many factors such as geography, economic policies, and political, social and cultural structures can be shown as the main reasons behind the backwardness of the eastern regions. Geographically, east side of the country is a landlocked and mountainous region. These geographical characteristics lead to economic and social isolation and create unfavorable environment for agricultural production in terms of productivity and agricultural diversity.

Turkey is a country in between Europe and Asia. The unique geographic placement of the country sometimes has leaded to a fragile political environment that Turkey faced. During the Republican period, eastern regions were not attractive for investment since Turkey has cut its trade ties with the neighboring countries where located east side of the country. Human and physical capital of the east region have shifted to the prosperous western regions (Dogruel and Dogruel, 2003: 298). Tekeli (1992) claims that there are two factors behind the differences between eastern and western regions: First, there are two economic system eastern and southern parts of Turkey during the Ottoman Empire; Caucasus and Russia in the East and the economic system around Aleppo in the South. The economic ties between two economic systems have broken after the collapse of the Ottoman Empire (Tekeli, 1992). Second, human loss due to war and compulsory migration have created demographic shift and the population density in the region has decreased by half. Hence, the market integration in the North, East and South of Anatolia collapsed and could never rebuild again (Tekeli, 1992).

Considering regional policies to reduce the disparities, there are no uniform policies during the Republican period. The early years of the period, from 1920s to 1940s, the governments have focused on development and industrialization policies which can obtain quick responses. War conditions and heavy foreign dept were other troubles of the country at that period. During the 1950s, the governments have implemented expansionary policies; the priorities have shifted to investments in rural sector and urban areas. However, there were no targeted regional policies yet. The regional policy implementations have begun with the Planned Period in 1960s (Dogruel, 2006: 173). After 1980s, export oriented policies have implemented in Turkey; financial and trade openness supported export promotion policies. Once again regional policies remained behind the growth targeted policies throughout three decades after 1980s.

The literature on regional disparities in Turkey has grown after the second half 1990s. Here, we may refer many works which related to the topic: Filiztekin (1998), Altinbas, Gunes and Dogruel (2002), Dogruel and Dogruel (2003), Karaca (2004), Erlat (2005), Erlat and Ozkan (2006), Kirdar and Saracoglu (2006) and Yildirim and Ocal (2006) discuss regional convergence in Turkey. Other works on regional disparities are Temel, Tansel and Gungor (2005) and Gezici and Hewings (2007). As more specific studies, Karahasan (2010) analyzes the dynamics and the variation of regional firm formation in Turkey, Dogruel and Dogruel (2011) focus on changes in spatial distributions and regional disparities in technology level in Turkish manufacturing sectors. Dogruel and Dogruel (2011) also deliberate the effects of openness on these issues.

One of the important dimensions of the analysis of regional differences is market potential. The purpose of the paper is to question how the market potential can be measured and to what extend market potential can explain the regional differences in Turkey. Regional differences are defined in terms of variation in regional wage income per worker, wage income per population and employment per population. Market potential concept defined by Harris (1954) and the wage equation of Redding and Venables (2004) are employed in the study.

The paper is organized as follows. Section 2 presents a brief theoretical background of the paper. Section 3 devoted to the methodology and empirical findings obtained from a set of spatial indices, descriptive statistics and econometric models estimated. Section 4 concludes the paper.

2. THEORETICAL BACKGROUND

There is a vast literature behind the formation of an agglomeration. The main question is what factors or mechanisms stimulate formation of an agglomeration? In fact, the answer is not simple and straightforward. However, New Economic Geography give comprehensive and informative explanation to this question. Geographical concentration and dispersion of economic activities are outcome of centripetal and centrifugal forces. Centripetal forces create agglomeration while centrifugal forces generate dispersion for firms and consumers: Fujita and Thisse (2002:5) summarize this process as "the observed spatial configuration of economic activities is then the result of a complicated balance of forces that push and consumers and firms." Krugman (1999) classifies centripetal forces as "market size effects (linkages)", "thick labor markets" and "pure external economies"; and, centrifugal forces as "immobile factors", "land rents" and "pure external diseconomies".

Krugman (1999) states that centripetal forces represent Marshallian external economies. The formation of an agglomeration depends on externalities. Industrial location decision is related location-specific externalities. Marshall ([1890] 1920: Chapter 10:21) has explained "modern forces" that are shaping geographical distribution of industries in his prominent work.

Interaction between space and economy has been the concern of many scientists starting from 19th century.[1] However, as Fujita and Thisse (2002:6) underline, neoclassical trade theory ignored impact of trade cost. Head and Mayer (2004: 2611) state that the New Economic Geography "emphasizes the interaction between trade costs and firm-level scale economies as a source of agglomeration."

The pioneering model in this field has created by Paul Krugman (Krugman, 1991a). The approach of Krugman is also called as new trade theory (Head and Mayer, 2004: 2613).[2] The model framework of New Economic Geography is discussed in Ottaviano and Thisse (2004: 2576) and Head and Mayer (2004: 2614); Head and Mayer also mention about subsequent contributors of the model and also alternative explanation of agglomeration.

[1] Fujita and Thisse (2002: 10-11) cite Thünen ([1826] 1966), Hotelling (1929), Lösch (1940), Isard (1956), Koopmans (1957), and Greenhut (1963) among the leading scientists of the period.
[2] The earlier model attempts discuss in Fujita and Thisse (2002:346, footnote 1).

Another comprehensive description of New Economic Geography can be found in Fujita and Thisse (1997).

In the original model of Paul Krugman (1991a) there are two sectors: first is agriculture and second is manufacturing sector. Helpman (1995) developed an alternative model by replacing Krugman's agricultural sector by housing sector. This modification alters the effect of transportation cost on creation of agglomeration.

Head and Mayer (2004: 2616) provide five preposition by reviewing "the empirics of agglomeration and trade" considering the most well-known New Economic Geography models. The prepositions are as follows:

(1) *Market potential raise local factor prices.*
(2) *Market potential induces factor inflows*.
(3) *Home market/magnification effect (HME)*.
(4) *Trade induces agglomeration (TIA)*.
(5) *Shock sensitivity.*

The first preposition provides us the conceptual framework for the constructing the empirical model in the paper. We can try to estimate the effects of market potential on wages. The early version of wage equation has been discussed by Krugman (1991b/1993).[3] The literature on the link between market potential and wage equation discuss in the following section. In addition to wage, the paper also considers the effect of market potential on employment.

3. DESCRIPTIVE ANALYSIS AND MODEL

The interaction between wages and market potential (or market access) is analyzed by Redding and Venables (2004) using a two-step method. The first step is the calculation of market potential (or market access), and the second step is the definition of wage equation.[4] In this study we follow the two-step method presented by Redding and Venables (2004). For each step of this procedure, there are alternative methods in the literature.

Although, different calculation techniques are employed in the empirical literature, market potential concept is based on Harris (1954). The market potential in Harris (2004) is weighted sum of purchasing power of hinterland of a region. Distance is used for weight. This concept is called as market potential or market access in the literature. Typical application of this methods are Rodriguez, Faina and Rodriguez (2007), Hanson (2005) and Niebuhr (2006). Rodriguez, Faina and Rodriguez (2007) calculate market access in Eurpean Union for NUTS2 region in order to explain education differences. Hanson (2005) and Niebuhr (2006) use the same method but they prefer to use the term "market potential".

[3] "The first published derivation of the wage potential equation seems to be the 1991 working paper version of Krugman (1993)." (Head and Mayer, 2004: 2622, footnote 8)
[4] Redding and Venables (2004) call this equation as "wage equation" and "wage equilibrium".

These studies aimed to explain wage differences. The alternative method for market access is proposed by Redding ve Venables (2004), which is based on gravitiy model. Breinlich (2006), Head and Mayer (2006) and Boulhol and Serres (2010) can be showh as the application of this method.

For the estimation for wage equation also there are different approaches. For example, while wage equation in Breinlich (2006) is very close to the one in Redding and Venables (2004), Hanson (2005) defines different wage equation. Niebuhr (2006) and Kosfled (2008) include spatial interaction into their wage equation.

For the market potential the study employs methods of Harris (1954). For the wage equation we estimate alternative specifications considering related literature.

3.1 IS MANUFACTURING D ISPERSION SUFFICIENT TO EXPLAIN REGIONAL INEQUALITIES?

The theoretical arguments of geographers are constructed over the two sector model that is covering manufacturing and agriculture sectors. For instance the Redding and Venables (2004) model focuses on the dispersion of the wage premium in manufacturing industry and questions the role of geography and remoteness for understanding regional inequalities in wages (and indirectly on employment). However it is questionable that to what extent it is sufficient to evaluate the regional inequalities by ignoring economic activities other than manufacturing sector. For example a specific location can be lagging in manufacturing (or industrial) production while having relatively sound potential in other sectors. Since data availabilities restricts us to evaluate regional inequalities in Turkey by only considering the manufacturing industry (within the scope of this research), it is important to see the employment trends in Turkey and to assess the magnitude of manufacturing industry.

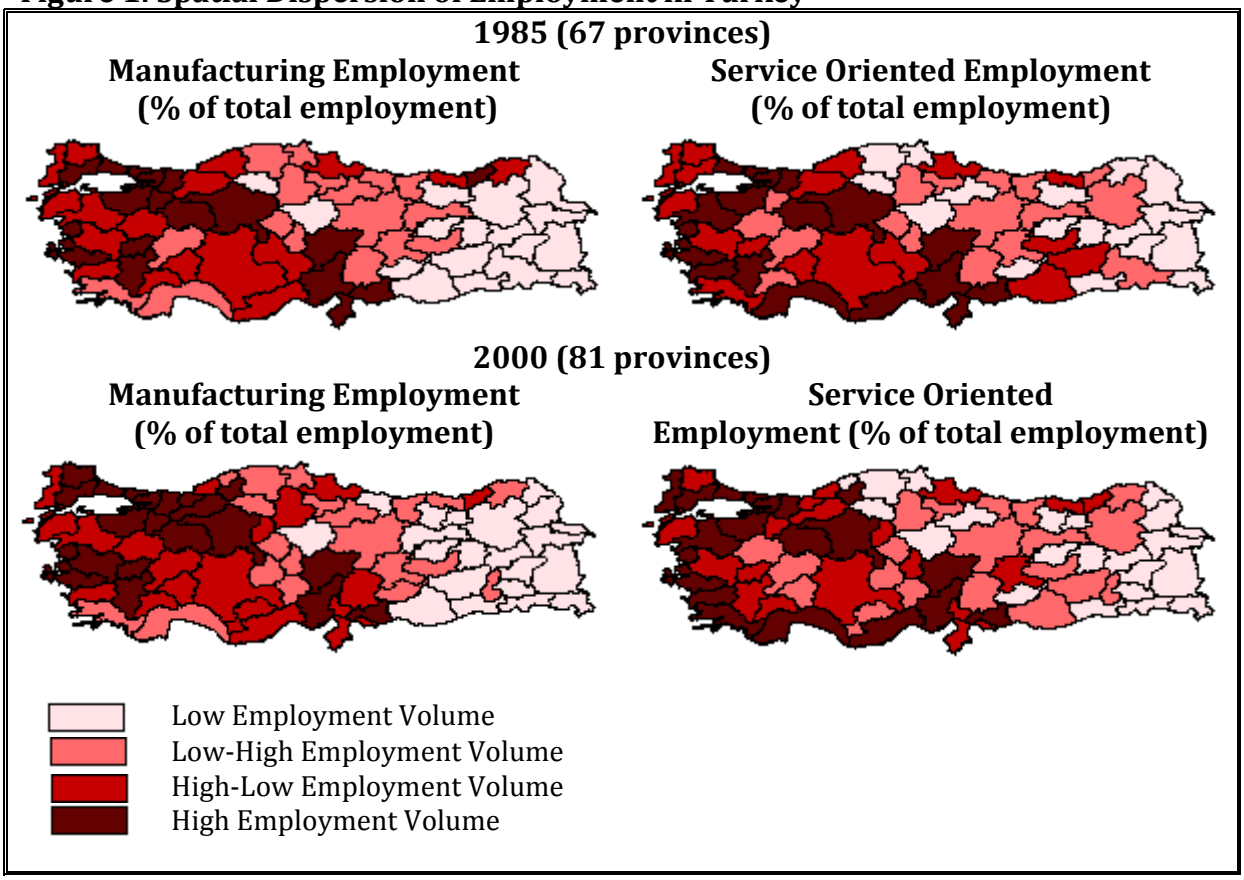
Table 1: Employment Distribution in Turkey (+ 15 age, % of total)

		1985	2009
AGRICULTURE	Agriculture	58.95	24.69
INDUSTRY	Mining and quarrying	0.67	0.48
	Manufacturing	10.63	18.56
	Electricity gas and water	0.11	0.37
CONSTRUCTION	Construction	3.65	5.87
SERVICES	Wholesale and retail trade, hotels and restaurants	6.73	21.35
	Transportation communication and storage	3.00	5.08
	Finance, insurance, real estate and business services	1.89	6.29
	Community social and personal services	13.85	17.31

Source: TURKSTAT

Table-1 displays employment shares of three major economic activities and their components for the years 1985 and 2009. 1985 data are from the 1985 population census and 2009 data are from Household Survey of TURKSTAT. Taking the high share of agricultural employment and its sharp decline on one side, the significance of manufacturing and service oriented economic activities is striking. In terms of historical trends it is plausible to conclude that manufacturing and service sectors are the leading and rising activities.

Figure 1: Spatial Dispersion of Employment in Turkey



Source: TURKSTAT

Another indicator calculated is the dispersion of these two economic activities across regions. Since national and regional level data in Turkey are not consistent time intervals presented in Table-1 and Figure-1 are not identical. Figure-1 gives spatial dispersion of employment of manufacturing and service sectors for 1985 and 2000 at NUTS 3 level.[5] Figures indicate that there is very limited change in the regional distribution of manufacturing and service sectors from 1985 to 2000. Moreover another crucial finding is related with the similarity between spatial dispersions of manufacturing and service sectors. There are some exceptions; for instance Antalya and Mugla in southern Turkey, Adiyaman, Diyarbakir, Elazig and Erzurum in eastern Turkey have low levels of manufacturing employment but high levels of service employment. However, both manufacturing and service employment share similar spatial pattern in terms of diversification between western and eastern regions. The similarity between dispersion of manufacturing and service sectors and considering the decreasing share of agriculture, focusing on only manufacturing sector may be sufficient for the analysis of the regional disparities in Turkey.

[5] For the post 2000 period we have the decomposition of employment at NUTS 2 level. These figures can be obtained from authors upon request. Data for the comparison of the dispersion of economic activities is collected from 1985 and 2000 population censuses. Service based economic activities here is the aggregation of Wholesale and retail trade, hotels and restaurants item and the Finance, insurance, real estate and business services items.

3.2 DISPERSION OF MARKET POTENTIAL, WAGES AND EMPLOYMENT

This section presents i) the calculation and illustration of dispersion of market potential in Turkey ii) alternative measures calculated for wage-employment dispersion in Turkey, and iii) a descriptive analysis on relation between market access and wage-employment indicators. The calculation of market potential *á la* Harris (1954) shows that there is a dual structure regarding degree of market access. The paper employs major inequality indices (CV and Theil) and latest measures of Spatial Concentration (Moran's I and Moran Scatter plot), in order to identify the wages-employment disparities. The use of scatter diagrams to discover relationship between market access and wage-employment indicators serve also as descriptive inputs for identification of the econometric models presented in the subsequent section.

The studies on Turkey confirm that a regional inequality in the form of west-east duality is a rigid and a continuous phenomenon especially after the 1980 liberalization era. As listed in the previous section(s); both the studies questioning the convergence hypothesis of the modern growth theories as well as the ones testing the contemporary methods of spatial econometrics confirm that regional inequalities in Turkey is persistent and the differences realized in the major determinants of regional growth among the geography of Turkey is no coincidence.

Although the studies on Turkey use different methods to evaluate the regional inequality problem, application of recent contributions in new economic geography (NEG) gains little attention. To our knowledge it is Karahasan and Bazo (2010) to test the impact of geography on regional differences in Turkey with special emphasize on human capital accumulation. Motivating from this gap, using the approach offered by Redding and Venables (2004) we first compute the ability of provinces to access to markets by calculating the market potential index. This index is first constructed by Harris (1954) and widely used by geographers after 1990s. Equation 1 is the traditional Harris (1954) market potential (MP) index, where Y represents the purchasing power of locations and D is the distance between the provinces under concern. Thus this index can be regarded as distance weighted purchasing power index. We use the provincial income measure to account for the purchasing power.[6]

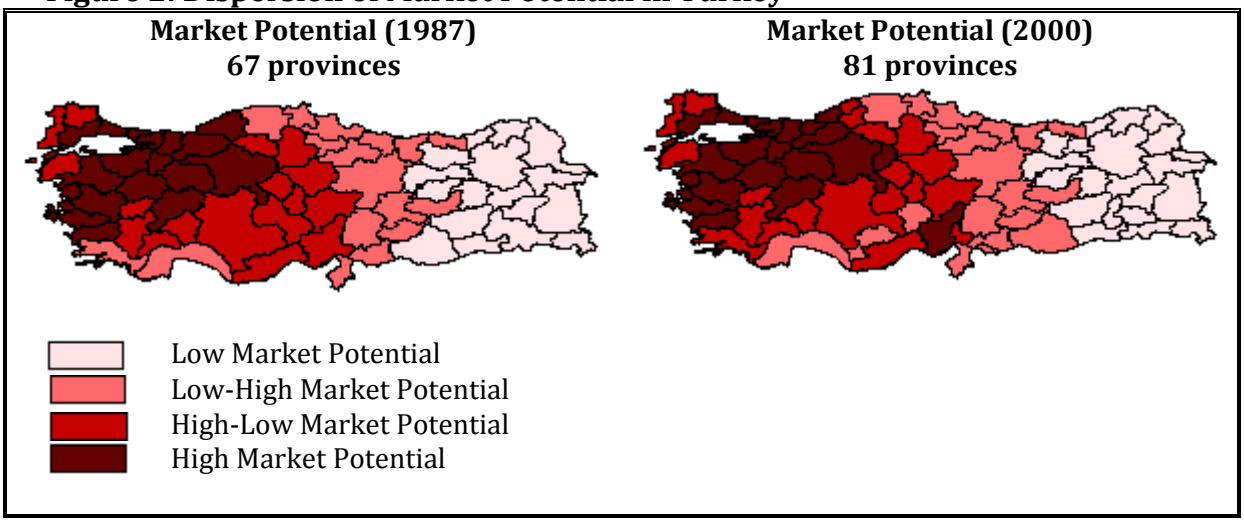
$$[1] \qquad MA_i = \sum_{j=1}^{K} \frac{Y_j}{D_{ij}}$$

Figure-2 shows the spatial dispersion of market potential of provinces in 1987 and 2000. The dual structure in the form of west and east inequality is quiet clear and in our view strengthens the findings of the previous studies in Turkey. An important remark here is the rigidity of the dispersion. Keeping in mind the increasing number of provinces from 1987 to 2000 the overall patterns seems to be persistent.

---

[6] Where the distance within a province is a matter of fact we use Head and Mayer (2006) approximation and compute the distance as follows: $D_{ii} = 0.66.\sqrt{\frac{Area_i}{\Pi}}$

Figure 2: Dispersion of Market Potential in Turkey



Source: TURKSTAT, Authors' own calculations

Given that findings in figure 2 shares the common patterns realized in regional inequalities in Turkey it is valuable to carry the discussion towards how regional wages and employment is dispersed and whether this dispersion also shares the pattern realized in the market potential of provinces. Findings are expected to form the background of the empirical model that will be built in the coming section.

Annual Manufacturing Industry Statistics of Turkish Statistical Institute (TURKSTAT) is the main data source in the paper.

While there are different ways to see the dispersion of wages and employment, following Combes et al. (2008) first the coefficient of variation (see equation 2) and next Theil index (equation 3 and 4) are computed. As offered by Combes et al. (2009) these inequality measures can also form a different approach to observe the concentration of employment among our geography, Turkey.

[2] $$CV_t = \frac{\sigma_t}{\mu_t}$$

While equation 2 is a straightforward way of looking at this dispersion, Theil index gives observer the ability to decompose interregional (between) and intraregional (within) inequalities (see Bourguignon, 1979). Equation 3 is the overall Theil index, whereas equation 4 is its decomposition. For equation 4 y_g and x_g represent the share of employment (or wages) and population as a percentage of Turkey's total in region g. This first part of equation 4 represents the inequality between regions. Meanwhile, T_g is the theil index computed for each of the regions; that will be weighted by y_g and will form the second component of the Theil index (within inequalities). Here crucial issue is related with the definition of the regions for the decomposition of the index. Since number of provinces

in Turkey varies between 67 and 81 from 1987 to 2001 we limit our Theil Index analysis with 67 provinces and divide them into 7 geographic regions. [7]

[3] $$T = \sum_{i=1}^{n} y_i \log \frac{y_i}{x_i} = T_{btw} + T_{wth}$$

[4] $$T = \sum_{g=1}^{n} y_g \log \frac{y_g}{x_g} + \sum_{g=1}^{n} y_g T_g$$

In our belief a rise in these two measures that can be labeled as a sign of rising inequality, also signals the increasing concentration of wages and employment at local level. Based on these remarks the computed coefficient of variation and Theil Index calculations are plotted in Figure-3. First of all overall pattern in figures is the rising concentration of wages (per worker and per population) and employment (per population). A second important fact coming from the Theil Index calculations is the source of this rising concentration. In all three figures, results confirm that the basis of this pattern comes from the concentration of these three indicators within the seven basic geographic regions. Although figure 3 does not give clues about the location of the concentration they can be regarded as a preliminary sign about the path of the regional differences in these three economic indicators in favor of rising concentration. However they still contain limited information and should be complemented by different approaches.

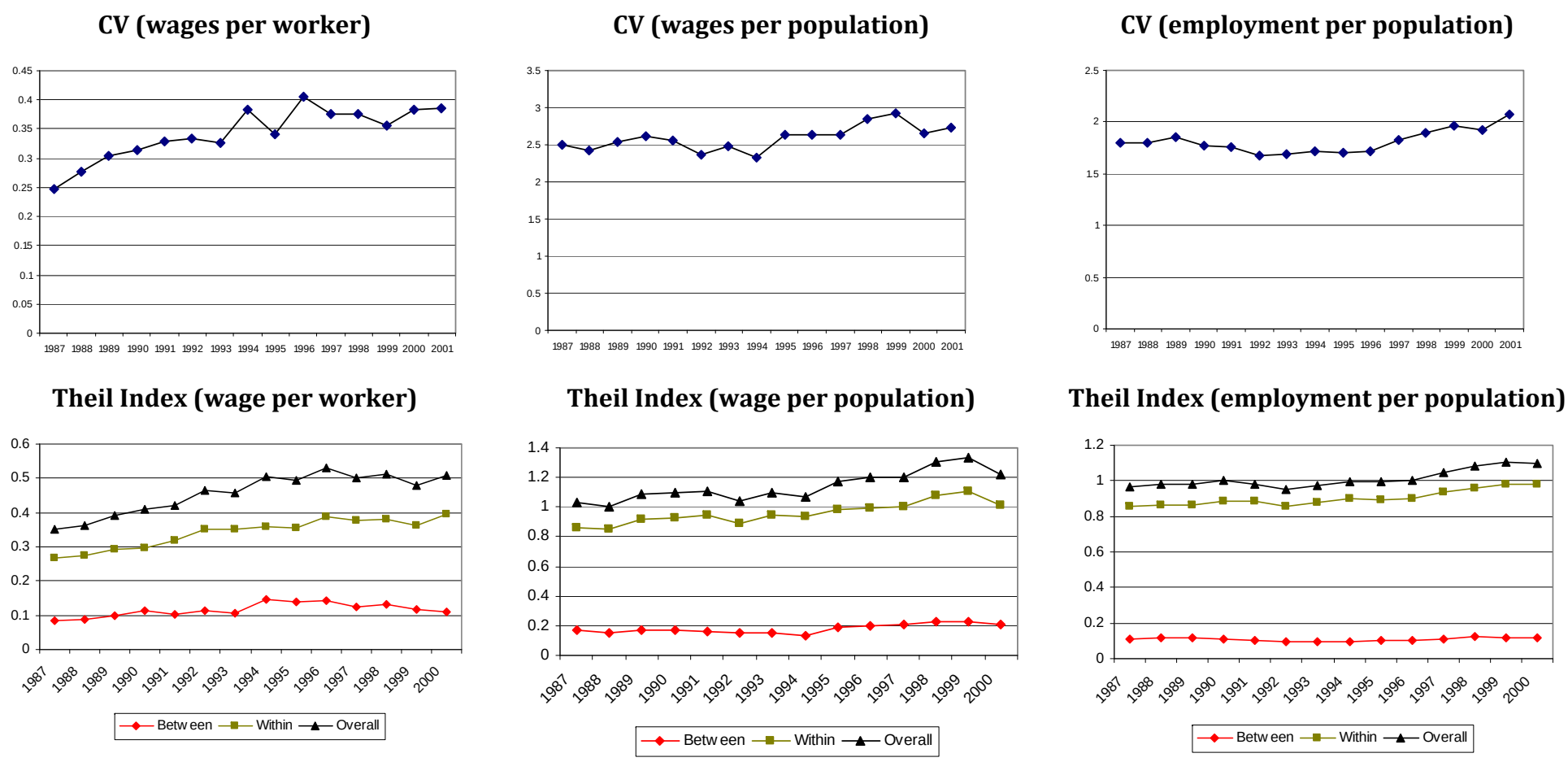
Gezici and Hewings (2007), Filiztekin (2009), Karahasan (2010) and Karahasan and Bazo (2010) remark that spatial interaction; in the form of neighborhood effect, is a non-negligible issue for understanding regional imbalances in Turkey.[8] Motivating both form these discussions as well as aiming to develop the previous findings regarding the concentration of wages and employment, a basic Exploratory Spatial Data Analysis (ESDA) is implemented. Spatial autocorrelation is computed by the approach offered by Moran (1950). Moran's I is a measure that computes the autocorrelation of a variable among different spatial units (equation 5).

[5] $$I_i = \frac{n}{s} \frac{\sum_i \sum_j w_{ij} z_i z_j}{\sum z_i^2}$$

[7] These geographic regions are as follows: Marmara, Aegean, Mediterranean, Central Anatolia, Blacksea, Eastern Anatolia and South East Anatolia.

[8] Combes et al. (2008) also classifies the usual spatial autocorrelation measures as spatial concentration indicators. Thus we believe computation of spatial measures will give a deeper insight about how employment and wages are dispersed in Turkey.

Figure 3: Concentration of Wages and Employment in Turkey 1987-2001 (*)



Source: TURKSTAT, Authors' own calculations
(*) Calculations for 67 provinces

Equation 5 is the Moran's *I* statistics where n represents the number of provinces; z's are the deviation of the wage (employment) of the province from the country average. W is the weight matrix and s is the summation of all elements in the weight matrix.[9] Results of the spatial autocorrelation are given in Table-2. It is obvious that market potential, which is already a geographical variable, is highly spatially dependent. Moreover wages (per population) and employment (per population) are also spatially dependent. However it is interesting that there is no spatial autocorrelation in wages (per worker). This finding is interesting, yet crucial. We will return to this once we start to build the relationship between wages (employment) and market potential, which is our measure of geographical proximity.

Table 2: Global Spatial Autocorrelation

	1987	**2000**
Market Potential	0.658*** (0.048)	0.721*** (0.046)
Wages (per worker)	0.029 (0.046)	0.008 (0.044)
Wage (per population)	0.223*** (0.045)	0.303*** (0.043)
Employment (per population)	0.242*** (0.045)	0.418*** (0.044)

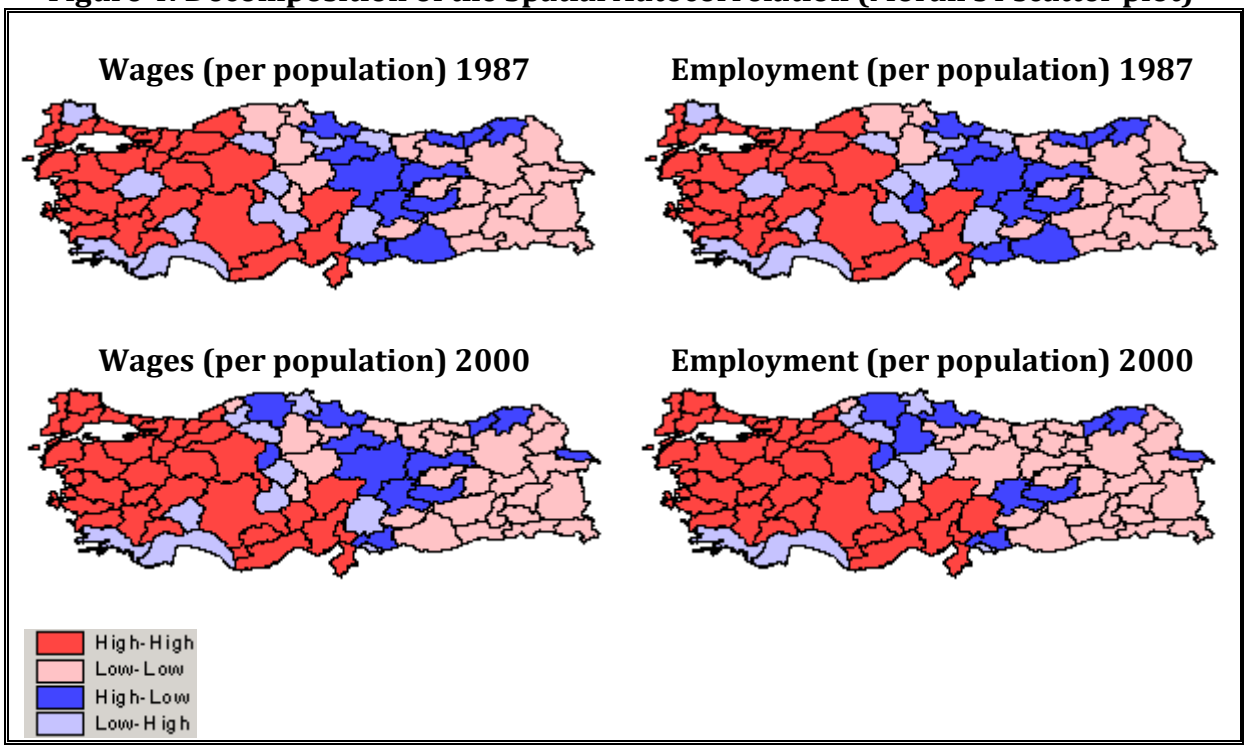
**** represents presence of spatial autocorrelation at 1%
(Pseudo-significance based on 999 random permutations), Standard errors in ( )

These spatial autocorrelation findings indicate that rising concentration detected from usual inequality measures are higher for wages (per population) and employment (per population) measures. Thus it will not be misleading to discuss that these two measures are more prone to remoteness. Even these findings give valuable information, they still lack in terms of the exact location of concentration and spatial autocorrelation. This is how Anselin (1993) criticize the Moran's *I* to be a global measure. Anselin (1993) underlines that decomposition of Moran's *I* is inevitable to understand the magnitude of spillovers at different locations of a given geography.[10] Figure 4 is the decomposition that gives us the scatter plot of the global statistics given in table 2.

[9] The most common approach to construct a weight matrix is the typical contiguity matrices; w=0 if two provinces are non-neighbors and w=1 if they are neighbors. However this approach can be problematic because it fails to account for the spillover between cross sections in the second and even third order. Although it is possible to increase the order of contiguity this time the equal weight given to different orders can be problematic. To deal with this issue an inverse distance weight matrix is preferred, with a squared power; that gives higher weight to close provinces and decreases the neighbor effect with rising distance. In any case weight matrix should be row standardized.

[10] An additional way of observing the decompositions is the local measures. Local Indicator of Spatial Association (LISA) is also a commonly applied statistics that also tests the significance of the local clusters and outliers (see Anselin, 1993 for details). These figures are not reported however available from authors' upon request.

Figure 4: Decomposition of the Spatial Autocorrelation (Moran's *I* scatter plot)

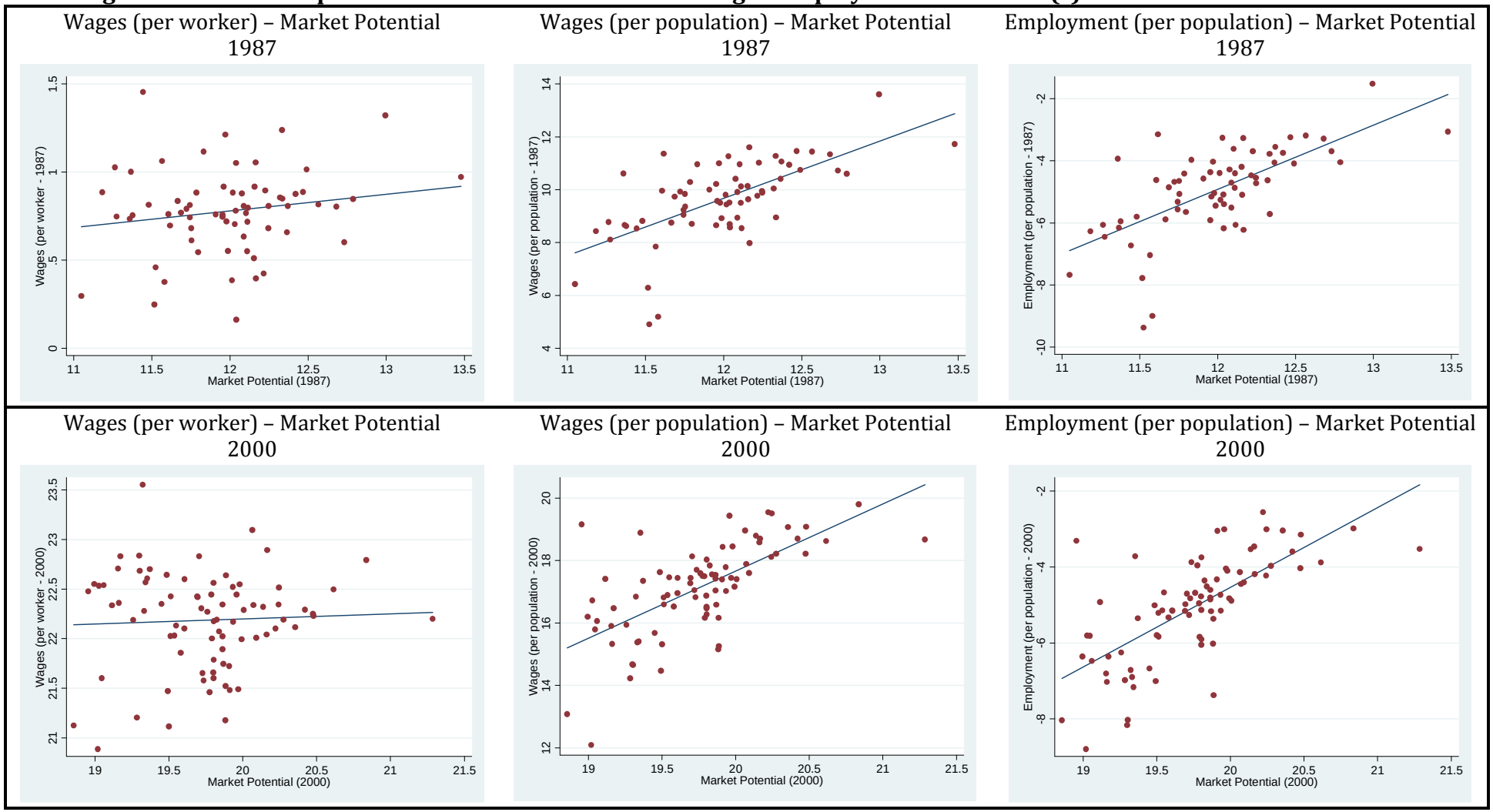


Source: TURKSTAT, authors' own calculations

The common characteristic of the illustrations in Figure-4 is the dual structure.[11] Western geography of Turkey is mostly composed of cluster of provinces with high employment and wages (both per population). On the other side eastern locations are mainly lagging. There are also a number of outliers that represents the spatial non-stationarity. One additional finding here is related with the similarity between figure 4 and previously illustrated market potential in Turkey (see figure 2). Comparison gives us strong evidence that high market potential areas are the ones with higher employment and wages (per population). In short remoteness acts as an important determinant for employment volumes. To broaden this possible relationship, figure 5 gives us the direct relationship between market potential of provinces and their wage and employment patterns. Again in line with the previous findings that underline the lack of spatial concentration in wages (per worker) both for 1987 as well as for 2000 we fail to detect a positive pattern in the scatter plots between geography and wages per worker. However what more interesting is that like the decomposed measure of spatial autocorrelation; when we investigate how the overall wage payments are distributed within the population, this time the picture seems to show us a positive interconnection with the market potential. This evidence becomes more meaningful when we contrast employment and market potential figures. It is evident that remote locations are endowed with a very low level of employment. However it is compulsory to test these findings by using a specification that controls for some other possible determinants of the process.

[11] Note that since wages per workers is not spatially dependent we do not decompose and plot its local realizations.

Figure 5: Relationships between Market Potential and Wages-Employment Indicators (*)



Source: TURKSTAT, Authors' own calculations

(*) all figures in *ln*. Figures are plotted for 67 and 81 provinces in 1987 and 2000 respectively

3.3 ECONOMETRIC SPECIFICATION AND EMPIRICAL FINDINGS

Based on the theoretical framework of geographers as well as the findings hitherto obtained, this section of the paper is devoted to the analysis of the relationship between wages (per worker and per population), employment (per population) and geographical proximity. Two cross sections are investigated; first for the 67 provinces of Turkey in1987, and for 81 provinces the same analysis is carried out for 2000.

The central discussion of NEG and more specifically Redding and Venables (2004) underlines that being close to markets (high market access or/and potential) will favor firms in terms of lower transportation costs. This transportation cost item is the remoteness and controlled for first by the market potential index computed in the previous section then next by using direct distance to three economic centers of Turkey; namely Istanbul, Izmir and Ankara. In this sense models I and II can be regarded as benchmark models, which will be later augmented in models III and IV. Model III tests whether market potential and direct distance works together or one of them dominates the other. And finally model IV is the robustness check which includes controls for differences in regional productivity measured by output per hours worked and population density as a discussion about agglomeration or congestion issues. These four models are estimated for three different dependent variables (wages per worker, wages per population, and employment per population) for the two cross sections under concern; 1987 and 2000. Findings are reported in tables 3 and 4.

[6] Model I $\ln Y = \alpha + \beta \ln MP + \varepsilon$

[7] Model II $\ln Y = \alpha + \phi \ln D_{IST} + \nu \ln D_{IZM} + \eta \ln D_{ANK} + \varepsilon$

[8] Model III $\ln Y = \alpha + \beta \ln MP + \phi \ln D_{IST} + \nu \ln D_{IZM} + \eta \ln D_{ANK} + \varepsilon$

[9] Model IV $\ln Y = \alpha + \beta \ln MP + \pi \ln productivity + \kappa \ln denisty + \varepsilon$

First important findings are related with the results obtained from models estimated for wages per worker variable. Market potential as well as direct distance fails to explain the dispersion of wages (per worker). This finding is in line with what we have discussed do far. Remember that wages per worker seems to have the lowest concentration potential with no sign of spatial concentration and very limited relationship with remoteness. We detect that only productivity seems to be the driving factor behind the dispersion of wages (per worker). Second issue is that for the models estimated for wages and employment per population, results indicate that geography matters. Models I and II for both dependent variables indicate that geography explains the dispersion of wages and employment. However when model III is estimated results pin points that market potential dominates the direct distance. Note that these results are persistent even model IV is estimated that also controls for productivity and population density. However note that inclusion of these variables do not improve the strength of the models in terms of significance.

Here an important issue is related with the spatial dependency of the two of the dependent variables under concern. Note that all models estimated are non-spatial models by construction (LS-models), however inclusion of the market potential variable seems to be

accounting for most of the spatial dependency. Going to the last line of Tables 3 and 4 will show us that residuals of the models are not spatially correlated.[12]

Estimation results of the models summarized in Tables-5 and 6 are informative. However results reported for year 2000 fails to satisfy an important prerequisite for LS estimations. That is to say that the significant spatial autocorrelation of the residuals of the models (for 2000 private sector) makes LS estimates unreliable (see the last line of table 6). To control for this spatial (or in other words spillover) effects, two additional models are estimated. Spatial autoregressive model (eq. 10) and spatial error model (eq. 11) both estimated by ML estimation. The former assumes that spatial interaction works over the dependent variable whereas the latter considers the spatial effects coming from the omitted variables. Estimation results presented in Table-7 are striking that overall significance of the models increases. Moreover even when we account for spatial effects, market potential of provinces is still successful to explain the dispersion of wages and employment across regions in Turkey.

[10] Model V $$\ln Y = \alpha + \beta \ln MP + \pi \ln productivity + \kappa \ln density + \rho W \ln Y + \varepsilon$$

[11] Model VI $$\ln Y = \alpha + \beta \ln MP + \pi \ln productivity + \kappa \ln density + \lambda We + \varepsilon$$

[12] There are different ways to estimate models with spatially correlated variables (see for instance Anselin, 2000). The most common ones are the spatial autoregressive and error models (SAR and SEM) that are both estimated by maximum likelihood (ML). Both SAR and SEM models are estimated for all models; however findings indicate that in neither of the models the spatial interaction variable is significant. However market potential is still significant. Since they do not improve the results that are obtained so far we are not reporting SAR and SEM models, however those estimation results are also available upon request.

Table 3: Regional Inequalities and Geography (LS Estimation Results for 1987)

	Wages (per worker)				Wages (per population)				Employment (per population)			
	(I)	**(II)**	**(III)**	**(IV)**	**(I)**	**(II)**	**(III)**	**(IV)**	**(I)**	**(II)**	**(III)**	**(IV)**
Market Potential	0.094 (0.066)	-	0.213 (0.175)	0.090 (0.068)	2.163*** (0.319)	-	3.522*** (0.837)	2.409*** (0.360)	2.069*** (0.292)	-	3.308*** (0.766)	2.319** (0.326)
Distance to Istanbul	-	-0.042 (0.031)	0.015 (0.056)	-	-	-0.514*** (0.165)	0.444 (0.271)	-	-	-0.472*** (0.152)	0.428* (0.248)	-
Distance to Izmir	-	0.015 (0.028)	0.048 (0.039)	-	-	-0.330** (0.153)	0.217 (0.188)	-	-	-0.345** (0.140)	0.168 (0.172)	-
Distance to Ankara	-	-0.007 (0.033)	0.017 (0.039)	-	-	-0.205 (0.178)	0.209 (0.186)	-	-	-0.198 (0.164)	0.192 (0.170)	-
Output Per hour	-	-	-	0.084*** (0.023)	-	-	-	0.045 (0.122)	-	-	-	-0.038 (0.111)
Population Density	-	-	-	0.006 (0.039)	-	-	-	-0.306 (0.209)	-	-	-	-0.313 (0.190)
R^2	0.02	0.03	0.05	0.21	0.41	0.25	0.41	0.43	0.43	0.27	0.43	0.46
Obs.	67	67	67	67	67	67	67	67	67	67	67	67
F test (p-value)	2.031 (0.16)	0.726 (0.54)	0.919 (0.46)	5.519 (0.00)	45.999 (0.00)	8.320 (0.00)	12.309 (0.00)	16.082 (0.00)	50.205 (0.00)	9.139 (0.00)	13.437 (0.00)	18.184 (0.00)
Moran's *I* (p-value)	0.030 (0.20)	0.012 (0.29)	0.021 (0.16)	-0.021 (0.91)	-0.057 (0.47)	-0.013 (0.67)	-0.054 (0.67)	-0.048 (0.60)	-0.070 (0.30)	-0.016 (0.70)	-0.069 (0.43)	-0.060 (0.42)

***, ** and * represents significance at 1%, 5% and 10% respectively. Standard errors in ( ) for coefficient estimates

Table 4: Regional Inequalities and Geography (LS Estimation Results for 2000)

	Wages (per worker)				Wages (per population)				Employment (per population)			
	(I)	**(II)**	**(III)**	**(IV)**	**(I)**	**(II)**	**(III)**	**(IV)**	**(I)**	**(II)**	**(III)**	**(IV)**
Market Potential	0.051 (0.122)	-	0.389 (0.277)	0.481 (0.126)	2.148*** (0.276)	-	2.761*** (0.631)	1.892*** (0.330)	2.096*** (0.243)	-	2.371*** (0.558)	1.982*** (0.311)
Distance to Istanbul	-	0.001 (0.062)	0.104 (0.096)	-	-	-0.497*** (0.156)	0.236 (0.219)	-	-	-0.498*** (0.137)	0.131 (0.193)	-
Distance to Izmir	-	0.026 (0.058)	0.088 (0.072)	-	-	-0.366** (0.146)	0.068 (0.165)	-	-	-0.392*** (0.128)	-0.019 (0.146)	-
Distance to Ankara	-	-0.012 (0.065)	0.039 (0.074)	-	-	-0.257 (0.163)	0.114 (0.169)	-	-	-0.244* (0.143)	0.075 (0.150)	-
Output Per hour	-	-	-	0.516*** (0.082)	-	-	-	0.732*** (0.213)	-	-	-	0.126 (0.201)
Population Density	-	-	-	-0.046 (0.081)	-	-	-	-0.011 (0.212)	-	-	-	0.034 (0.200)
R^2	0.01	0.01	0.02	0.36	0.43	0.28	0.41	0.52	0.48	0.34	0.46	0.49
Obs.	81	81	81	81	81	81	81	81	81	81	81	81
F test (p-value)	0.176 (0.68)	0.082 (0.97)	0.554 (0.70)	14.129 (0.00)	60.417 (0.00)	11.169 (0.00)	15.126 (0.00)	27.308 (0.00)	74.170 (0.00)	14.961 (0.00)	18.211 (0.00)	25.043 (0.00)
Moran's *I* (p-value)	0.017 (0.36)	0.003 (0.48)	0.018 (0.23)	0.030 (0.20)	-0.031 (0.83)	0.017 (0.29)	-0.025 (0.91)	-0.016 (0.86)	0.009 (0.47)	0.068** (0.02)	0.009 (0.36)	0.016 (0.34)

***, ** and * represents significance at 1%, 5% and 10% respectively. Standard errors in ( ) for coefficient estimates

Table 5: Regional Inequalities and Geography (LS Estimation Results for 1987, only private sector)

	Wages (per worker)				Wages (per population)				Employment (per population)			
	(I)	**(II)**	**(III)**	**(IV)**	**(I)**	**(II)**	**(III)**	**(IV)**	**(I)**	**(II)**	**(III)**	**(IV)**
Market Potential	0.226** (0.089)	-	0.282 (0.239)	0.187** (0.088)	3.018*** (0.346)	-	4.355*** (0.913)	3.161*** (0.380)	2.760*** (0.307)	-	4.052*** (0.806)	2.996*** (0.342)
Distance to Istanbul	-	-0.092** (0.042)	-0.015 (0.077)	-	-	-0.757*** (0.186)	0.428 (0.296)	-	-	-0.657*** (0.167)	0.445* (0.261)	-
Distance to Izmir	-	-0.005 (0.039)	0.038 (0.053)	-	-	-0.487*** (0.172)	0.188 (0.205)	-	-	-0.473*** (0.154)	0.155 (0.181)	-
Distance to Ankara	-	-0.004 (0.045)	0.028 (0.053)	-	-	-0.253 (0.200)	0.260 (0.203)	-	-	-0.247 (0.179)	0.230 (0.179)	-
Output Per hour	-	-	-	0.256*** (0.057)	-	-	-	0.513** (0.245)	-	-	-	0.219 (0.221)
Population Density	-	-	-	-0.009 (0.052)	-	-	-	-0.293 (0.223)	-	-	-	-0.343* (0.201)
R^2	0.08	0.09	0.11	0.32	0.54	0.40	0.56	0.57	0.55	0.40	0.58	0.58
Obs.	67	67	67	67	67	67	67	67	67	67	67	67
F test (p-value)	6.369 (0.01)	1.968 (0.12)	1.832 (0.13)	9.807 (0.00)	75.788 (0.00)	13.781 (0.00)	19.591 (0.00)	28.090 (0.00)	80.479 (0.00)	14.265 (0.00)	21.134 (0.00)	28.420 (0.00)
Moran's *I* (p-value)	0.065** (0.03)	0.046* (0.06)	0.043* (0.05)	-0.039 (0.76)	-0.005 (0.65)	0.044* (0.07)	-0.001 (0.38)	-0.019 (0.86)	-0.041 (0.71)	0.028 (0.15)	-0.036 (0.98)	-0.035 (0.84)

***, ** and * represents significance at 1%, 5% and 10% respectively. Standard errors in ( ) for coefficient estimates

Table 6: Regional Inequalities and Geography (LS Estimation Results for 2000, only private sector) (*)

	Wages (per worker)				Wages (per population)				Employment (per population)			
	(I)	**(II)**	**(III)**	**(IV)**	**(I)**	**(II)**	**(III)**	**(IV)**	**(I)**	**(II)**	**(III)**	**(IV)**
Market Potential	0.403*** (0.097)	-	0.622*** (0.234)	0.306*** (0.093)	3.081*** (0.336)	-	3.867*** (0.805)	3.601*** (0.374)	2.678*** (0.309)	-	3.244*** (0.743)	3.294*** (0.367)
Distance to Istanbul	-	-0.100** (0.052)	0.071 (0.082)	-	-	-0.722*** (0.195)	0.348 (0.281)	-	-	-0.621*** (0.176)	0.276 (0.259)	-
Distance to Izmir	-	-0.057 (0.048)	0.040 (0.059)	-	-	-0.572*** (0.180)	0.035 (0.203)	-	-	-0.514*** (0.163)	-0.004 (0.188)	-
Distance to Ankara	-	-0.040 (0.054)	0.041 (0.060)	-	-	-0.373* (0.202)	0.138 (0.207)	-	-	-0.332* (0.182)	0.096 (0.191)	-
Output Per hour	-	-	-	0.456*** (0.056)	-	-	-	0.977*** (0.226)	-	-	-	0.520** (0.222)
Population Density	-	-	-	-0.062 (0.056)	-	-	-	-0.843*** (0.228)	-	-	-	-0.780*** (0.224)
R^2	0.17	0.11	0.19	0.56	0.52	0.38	0.53	0.64	0.49	0.40	0.50	0.58
Obs.	81	81	81	81	81	81	81	81	81	81	81	81
F test (p-value)	17.041 (0.00)	3.303 (0.02)	4.425 (0.00)	32.006 (0.00)	84.079 (0.00)	15.924 (0.00)	21.134 (0.00)	46.518 (0.00)	74.890 (0.00)	15.048 (0.00)	18.699 (0.00)	34.351 (0.00)
Moran's *I* (p-value)	-0.004 (0.68)	0.001 (0.49)	-0.001 (0.45)	0.096*** (0.00)	0.075** (0.02)	0.174*** (0.00)	0.066** (0.02)	0.126*** (0.00)	0.115 (0.00)	0.210*** (0.00)	0.105 (0.00)	0.150*** (0.00)

***, ** and * represents significance at 1%, 5% and 10% respectively. Standard errors in ( ) for coefficient estimates

(*) For provinces of Bingol, Gumushane, Tunceli, Sirnak and Kilis there is missing data for private sector in 2000. As to avoid missing cross section in the data analysis we decided to use the average figures of the NUST 2 regions that each province belongs to.

Table 7: Regional Inequalities and Geography (ML Estimation Results for 2000, only private sector)

	Wages (per worker)		**Wages (per population)**		**Employment (per population)**	
	(V)	(VI)	(V)	(VI)	(V)	(VI)
Market Potential	0.227** (0.113)	0.311** (0.127)	2.127*** (0.572)	3.382*** (0.557)	1.870*** (0.520)	3.022*** (0.565)
Output Per hour	0.467*** (0.054)	0.472*** (0.051)	1.005*** (0.205)	0.929*** (0.201)	0.526*** (0.199)	0.450** (0.194)
Population Density	-0.060 (0.055)	-0.079 (0.056)	-0.685*** (0.219)	-0.935*** (0.226)	-0.614*** (0.211)	-0.853*** (0.221)
ρ	0.259 (0.200)	-	0.529*** (0.152)	-	0.575*** (0.149)	-
λ	-	0.469** (0.193)	-	0.575*** (0.170)	-	0.620*** (0.159)
Obs.	81	81	81	81	81	81
R^2	0.56	0.57	0.67	0.55	0.61	0.45

***, ** and * represents significance at 1%, 5% and 10% respectively. Standard errors in ( ) for coefficient estimates

(*) For provinces of Bingol, Gumushane, Tunceli, Sirnak and Kilis there is missing data for private sector in 2000. As to avoid missing cross section in the data analysis we decided to use the average figures of the NUST 2 regions that each province belongs to.

REFERENCES

Anselin L., (1993), "The Moran Scatter plot as an ESDA Tool to Assess Local Instability in Spatial Association," Research Paper No: 9330, GISDA Specialist Meeting GIS and Spatial Analysis

Anselin L., (2000), Spatial Econometrics, in Baltagi, B., (Ed), *A Companion to Theoretical Econometrics*, pp. 310-330, Blackwell, Oxford.

Boulhol, Herve´ and Alain de Serres, (2010), "Have developed countries escaped the curse of distance?" *Journal of Economic Geography* 10, pp. 113–139.

Bourguignon F., (1979), "Decomposable Income Inequality Measures," *Econometrica*, Vol.47, No.4, pp 901-920

Breinlich, Holger (2006), "The spatial income structure in the European Union—what role for Economic Geography?" Journal of Economic Geography (2006) Page 1 of 25

Combes, P.P., Mayer T., and Thisse J-F., (2008), *Economic Geography, The Integrations of Regions and Nations*, Princeton University Press, Princeton Oxford

Dogruel, Fatma (2006), "Turkiye'de Bolgesel Politikalar," (Regional Policies in Turkey), in A. Eraydin (Ed), *Degisen Turkiye Donusen Mekan* (Changing Turkey and Transforming Space), Dost Kitapevi Publications, Ankara, pp. 164-195, 2006 (In Turkish).

Dogruel, Fatma and A. Suut Dogruel (2003), "Turkiye'de Bolgesel Gelir Farkliliklari ve Buyume," Regional Income Differences and Growth in Turkey) in A. H. Kose, F. Senses and E. Yeldan (Eds), *Iktisat Uzerine Yazilar I: Kuresel Duzen, Birikim, Devlet ve Siniflar - Korkut Boratav'a Armagan* (Essays on Economics I: Global Order, Accumulation, State and Classes - Festschrift in Honor of Korkut Boratav), Iletisim Publications, Istanbul, pp.287-318, 2003 (in Turkish).

Dogruel, Fatma and A. Suut Dogruel (2011), "Openness, Technological Changes and Differentiation in Turkish Manufacturing Sector" in Hadi Esfehani and Gulcay Tuna (Eds.) D*evelopment in the Middle East and North African Countries: Some Contemporary Issues*, Novascience Publishing House (forthcoming).

Erlat, Haluk (2005), "Türkiye'de Bölgesel Yakınsama Sorununa Zaman Dizini yaklaşımı" Erlat, H. (Ed.) (2005), *Bölgesel Gelişme Stratejileri ve Akdeniz Ekonomisi* (pp. 251-278). Ankara: Türkiye Ekonomi Kurumu.

Erlat, Haluk and Pelin Ozkan (2006). "Absolute Convergence of The Regions and Provinces of Turkey," Electronic journal, Volume 8, Middle East Economic Association and Loyola University Chicago, September. http://www.luc.edu/orgs/meea/volume8/PDFS/erlat.pdf

Filiztekin, Alpay (1998), "Convergence across Industries and Provinces in Turkey" Koc University Working Paper No. 1998/08. http://www.ku.edu.tr/ku/images/EAF/afiliztekin.pdf

Filiztekin, Alpay, (2009), "Regional Unemployment in Turkey," *Papers in Regional Science*, Vol. 88, No.4, pp.863-878

Fujita, Masahisa and Jacques-François Thisse (1997) "Économie géographique, Problèmes anciens et nouvelles perspectives" *Annales d'Économie et de Statistique*, No. 45, pp. 37-87.

Fujita, Masahisa and Jacques-François Thisse (2002), *Economics of agglomeration: cities, industrial location, and regional growth*, Cambridge University Press, Cambridge, UK.

Gezici, F. and Hewings, G.J.D. (2007), "Spatial Analysis of Regional Inequalities in Turkey" *European Planning Studies*, 15(3), 383-403.

Hanson, Gordon H., "Market potential, increasing returns and geographic concentration" *Journal of International Economics*, 67 (2005) 1 –24.

Harris C., (1954), "The Market as a Factor in the Localization of Industry in the United States," *Annals of the Association of American Geographers*, Vol.64, pp.315-348

Head, Keith and Thierry Mayer (2004), "The Empirics Of Agglomeration And Trade" in J. V Henderson and J.E Thisse (Eds), *Handbook of Regional and Urban Economics,* Volume 4. Chapter 59, pp. 2609-2669.

Head, Keith and Thierry Mayer (2006), "Regional wage and employment responses to market potential in the EU," *Regional Science and Urban Economics*, 36 (2006) 573–594.

Helpman, Elhenan (1995), "The Size of Regions", The Foerder Institute for Economic Research. Published in: Topics in Public Economics edited by David Pines, Efraim Sadka and Itzhak Zilcha. Cambridge University Press 1998.

Karaca, O. (2004), "Turkiye'de Bolgeler Arası Gelir Farkliliklari: Yakinsama Var mi" Turkish Economic Association (TEA), Discussion Paper No. 2004/7. http://www.tek.org.tr

Karahasan B.C. and Bazo E.L., (2010), "Role of Geography in Understanding the Human Capital Dispersion: Evidence from Turkey", paper presented at the annual meeting of Middle East Economic Association (MEEA), Istanbul

Karahasan B.C., (2010), Dynamics and Variation of Regional Firm Formation - Case of Turkey - , PhD Thesis, Marmara University

Kırdar, M.G. and Saracoglu, D.S. (2006), "Does Internal Migration Lead to Faster Regional Convergence in Turkey? An Empirical Investigation," Turkish Economic Association (TEA), Discussion Paper No. 2006/6. http://www.tek.org.tr

Krugman, Paul (1993), "First Nature, Second Nature, and Metropolitan Location" *Journal of Regional Science*, Volume 33, Issue 2, pages 129–144, May 1993.

Krugman, Paul (1991a), "Increasing Returns and Economic Geography," *The Journal of Political Economy*, Vol. 99, No. 3, pp. 483-499

Krugman, Paul (1991b), "First Nature, Second Nature, and Metropolitan Location" NBER Working Paper No. 3740, Issued in June 1991.

Krugman, Paul. (1999), "The Role of Geography in Development," in Pleskovic and Stiglitz (Ed's) *Annual World Bank Conference on Development Economics 1998*, The World Bank, Washington, D.C., pp.89-125

López-Rodríguez, J., Faiña, A. and J. López Rodríguez (2007). "Human Capital Accumulation and Geography: Empirical Evidence from the European Union," *Regional Studies*, Vol.41, No.2, pp.217-234.

Marshall, Alfred. ([1890] 1920), *Principles of Economics*. Macmillan and Co., Ltd, London. [Online] available from http://www.econlib.org/library/Marshall/marP24.html; accessed 12 October 2008 [BOOK IV, CHAPTER X, Industrial Organization, Continued. The Concentration of Specialized Industries in Particular Localities.]

Moran, P. A. P., (1950), ''Notes on Continuous Stochastic Phenomena,'' *Biometrika* Vol. 37, pp. 17–23.

Niebuhr, Annekatrin,(2006), " Market access and regional disparities: New economic geography in Europe," *Annals of Regional Science*, 40:313–334.

Ottaviano, Gianmarco and Jacques-Francois Thisse (2004), "Agglomeration and Economic Geography," in V Henderson and J.E Thisse (Eds), *Handbook of Regional and Urban Economics,* Volume 4. Chapter 58, pp. 2563-2608.

Redding S., Venables A. J., 2004. "Economic geography and international inequality," *Journal of International Economics*, Vol. 62, pp. 53–82.

Temel, T, Tansel, A, and Gungor, N.D. (2005), "Convergence of Sectoral Productivity in Turkish Provinces: Markov Chains Model" *International Journal of Applied Econometrics and Quantitative Studies*, 2,1-35.

Tekeli, İlhan (1992), "UNDP İnsanca Gelişme Raporu: Bölgesel Kalkınma Politikaları Üzerindeki Etkileri," İnsanca Gelişme Birinci Türkiye Konferansı (Rapor), T.C. Hükümeti ve Birleşmiş Milletler Kalkınma Programı (UNDP), Ankara.

Yıldırım, Julide and Nadir Öcal (2006), "Income Inequality and Economic Convergence in Turkey," *Transition Studies Review*, Vol. 13, No. 3, pp. 559–568.