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Regional Economic Activity in Turkey: A New Economic Geography Approach[1]

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Abstract

This paper studies the spatial economic activity in Turkey and estimates the correlation between wages and consumer demand across NUTS1 regions of Turkey. First, simple market potential function is used to test whether closeness to larger markets has impact on wages. Second, Krugman (1993) economic geography model is estimated to see the agglomeration forces in Turkey. The results suggest that wages are higher in the regions close to larger markets and low trade costs and high share of expenditure on manufactured goods are the forces of agglomeration in Turkey.

Keywords: Economic geography, market potential, regional disparities, Turkey.
JEL Classification: F12, R12.

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Özet

Türkiye'de Bölgesel Ekonomik Aktivite: Yeni Ekonomik Coğrafya Yaklaşımı

Bu çalışma Türkiye'deki mekansal ekonomik aktiviteyi ve Türkiye'nin NUTS1 olarak sınıflandırılmış bölgeleri üzerinde ücret ve müşteri talebi arasındaki ilişkiyi inceler. Öncelikle büyük pazarlara yakınlığın ücretler üzerindeki etkisini test etmek için pazar potansiyel fonksiyonu kullanılır. Daha sonra, Türkiye'deki yığılma kuvvetlerini anlamak için Krugman'ın (1993) ekonomik coğrafya modeli değerlendirilir. Elde edilen sonuçlar büyük pazarlara yakın olan bölgelerde ücretlerin yüksek olduğunu ve düşük ticari maliyetler ile tüketici giderleri içinde sanayi mallarının oranının yüksekliğinin Türkiye'deki yığılma kuvvetleri olduğunu önerir.

Anahtar Kelimeler: Ekonomik coğrafya, market potansiyeli, bölgesel farklılıklar, Türkiye.
JEL Sınıflaması: F12, R12.

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1. Introduction

In this paper, the spatial distribution of economic activity in regions of Turkey and product-market linkages between these regions are analyzed. The idea stems from the NEG (New Economic Geography) theories which suggest that proxy to the markets for the related goods shape the economic activity in a given location. The other features of NEG theories are monopolistic competition, trade costs and agglomeration of industries.

Regional disparities have always been an important debate in Turkey since the establishment of the Republic in 1923. Despite the enforcement of regional development policies in different time periods, the economic differences between the regions have never disappeared. The goal of this study is to provide an analysis on the regional development in Turkey through the effects of agglomeration and dispersion forces. In this paper, the spatial analysis of income and development across 12 regions of Turkey is studied by estimating two non-linear NEG models. To our knowledge, this study would be the first empirical estimation

of non-linear NEG model on Turkey and second on any developing country since the previous studies were done on developed countries.[3]

This paper first estimates the Harris (1954) market potential function in which the nominal wages are increasing with higher income in other regions and decreasing function of transport costs. The intuition is that distance is a barrier to trade and after weighting the distance in the model, the market potential is the sum of income in other regions. It is also assumed that wages are proportional to market potential which allows us to estimate the model for Turkey.

Second approach followed in this paper is Krugman's (1993) augmented market potential function. Krugman model raises the importance of economies of scale industries and transportation costs. With increasing returns to scale more firms locate together, specialization of labor increases, competition between suppliers increase which all reduce the production costs and enlarge the markets for the firms. Krugman model also determines the wages endogenously as a function of wages and income of other regions.

So far, except Farmanesh (2009), only developed countries have been studied for NEG estimations. Hence, it is worthwhile to estimate a developing country and to compare the results with developed country. Moreover, Turkey is an excellent country to study the NEG models because of its diverse geographic structure and regional cultures.

The estimation results exhibit that Turkey would fit both Harris' (1954) market potential function model and Krugman (1993) model satisfactorily but some parameter values of the latter are out of range predicted by theory. The findings of this paper suggest that wages are higher in regions with higher consumer demand in Turkey and Turkish industry exhibit constant returns to scale.

2. Literature Review

The one of the interesting features of economic life is the uneven distribution of economic activity in the space, in the countries and even in the regions. The very early paper tries to explain the differences of economic activity in space is inscribed by Harris (1954) in which he presents the market potential idea where the demand for the goods produced in a given region is the total sum of purchasing power in other locations weighted by distance.

[3] See Farmanesh (2009)

After three decades, a seminal paper of Krugman (1991) explains agglomeration and city formation by transport costs and returns to scale. This work is widely accepted as the emergence of so-called "New Economic Geography" literature.[4] In his paper, the spatial distribution of economic activity is determined by the two agglomeration and dispersion forces. Home market effect, increasing returns to scale and transport costs and price index effect, variety and transport costs imply lower cost to the firms are the two agglomeration forces. The two dispersion forces are agricultural labor which is immobile and market crowding effect, the higher number of competitors in large markets due to low transport costs.

Fujita, Krugman and Venabels (1999) derived Harris market potential from spatial models. In this version, the wages are higher near the higher consumer demand and industrial agglomeration. They also suggest that firms are attracted to cities because of large markets but distracted because of congestion costs.

Lately, there has been empirical study of these models to test the effects on country level. Hanson (2005) divided them into three strands; first strand is testing Krugman (1980) home-market effect whether productions are concentrated near large markets, second strand is in line with Eaton and Kortum (1999) and Keller (2002) examining the diffusion of technology in space and its effect on industry location, third strand analysis whether incomes are higher in region with higher access to larger markets. The influential papers on third strand are Hanson (1998 and 2005), Redding and Venables (2004), Brakman, Garretsen and Schramm (2004) and Garcia Pires (2006).

Garcia (2006) and Farmanesh (2009) use Krugman (1993) model, multi-region version of Krugman (1991), whereas the other papers mentioned use Helpman (1998) variant of Krugman model. The main difference between two models is that Krugman treats constant return to scale good as a freely traded product such as agricultural product where Helpman treats it as a non-tradable product such as housing. Considering the higher housing prices in more populated regions, an extra centrifugal force is presented. As a result, trade cost would have different impact on different models. In Krugman (1991) model the reduction in trade costs promotes agglomeration, on the other hand, in Helpman (1998) model the reduction in trade costs promotes dispersion. Despite these two models seem very different, Puga (1999) showed that Krugman model predicts agglomeration when there is decrease from high trade cost and Helpman (1998) predicts dispersion when there is decrease from low trade costs.

[4] See Redding (2009) for detailed review of New Economic Geography literature.

Generally, Helpman (1998) model were used in the previous studies but Garcia Pires (2006) shows that Krugman (1993) model is also suitable for empirical test since it is generalized to multiple regions. In addition Puga (1999) states that Krugman (1991) is a regional model which would be appealing to study countries with very strong regional characteristics and differences.

The literature on regional disparities and economic geography of Turkey has grown in 2000s. The important researches analyzing the regional disparities in Turkey are Dogruel & Dogruel (2003), Karaca (2004), Erlat & Ozkan (2006) and Kirdar & Saracaoglu (2006) where the authors mainly discuss the regional convergence in Turkey. Karahasan (2010) intends to understand the variation and dynamics of the firm formation on regional base. Dogruel & Dogruel (2011) uses Turkish manufacturing sector data to analyze the spatial economic activity and regional disparities in Turkey. Karahasan et al. (2011) uses linear version of Harris market potential and wage equation of Redding & Venables (2004) to explain the regional disparities in Turkey. Their result suggests that variation in market potential is an important source of regional differences.

Considering the spatial economic activity in Turkey, Akgungor & Falcioglu (2005) focuses on agglomeration of industries in Turkey across regions and they find out that manufacturing industry has aptitude for regional specialization. Their results are also in line with new economic geography literature where economies of scale and linkages among firms are the motivation for the agglomeration of Turkish firms. Falcioglu (2011) explores the spatial determinants of productivity in Turkish manufacturing industry on regional level. Her findings indicate that related variety, proximity to core areas, capital intensity and high wages contribute to regional productivity.

3. Theory and Econometric Model

The methodology in this paper generally follows Garcia Pires (2006) and Farmanesh (2009). The first model is Harris (1954) market potential function (MPF) and second model is Krugman (1993) model. Since this paper is empirical application of these two models and the theory underlying these models is out of scope, we simply discuss important features of the models and their econometric versions.

MPF function can be written as in equation (1) by following the logic of NEG models. The nominal wages are related to the income of other regions by assuming that wages

are proportional to the economic activity. In addition, this relation is weighted by the distance because distance act as a barrier to trade.

$$\ln(w_{i,t}) = \theta + \alpha \log\left(\sum_{k} Y_{k,t}\, e^{-\beta(d_{i,k})} \right) + \varepsilon_t \tag{1}$$

In equation (1), $w_{i,t}$ is the wage of the region *i* at time *t*, $Y_{k,t}$ is the income of the region *k* at time *t*, $d_{i,k}$ is the distance between region *i* and *k*, θ is the constant term and ε_t is the error term. The parameters (α) and (β) are going to be estimated. The parameter (α) measures the effect of purchasing power and (β) measures the effect of distance from consumer markets on a nominal wage in a region *i*. The theoretical restriction imply that both parameters, (α) and (β), must be higher than zero.

In Krugman model the economic geography is shaped by the forces of agglomeration and dispersion. There are two goods in the model, one is differentiated and another one is homogenous which are assumed as manufactured goods and agricultural goods, respectively.[5] There are two types of labors; farmers are immobile labors and workers are mobile labors. Homogenous goods trade freely; however, the differentiated goods are subject to trade costs. In the model, inverse elasticity of substitution represents economies of scale and higher economies of scale promote agglomeration. The workers are pulled to the location because of higher wages due to economies of scale but they are pushed because of competition. The following equation represents the estimation of Krugman model;

$$\ln(w_{i,t}) = \theta + \sigma^{-1} \log\left(\sum_{k} Y_{k,t}\, w_{k,t}^{\frac{\sigma-1}{\mu}}\, e^{-\tau(\sigma-1)d_{i,k}} \right) + \varepsilon_t \tag{2}$$

In equation (2), $w_{i,t}$ is the wage of the region *i* at time *t*, $Y_{k,t}$ is the income of the region *k* at time *t*, $w_{k,t}$ is the wage of the region *k* at time $d_{i,k}$ is the distance between region *i* and *k*, θ is the constant term and ε_t is the error term. The parameters (σ), (τ) and (μ) are going to be estimated. The parameter (σ) is the elasticity of substitution, the parameter (τ) is trade costs and (μ) is the share of households' expenditure on manufactured goods. The agglomeration of the industries are promoted by low (σ) because it lets industries to have higher returns to scale, high (μ) since it supports higher demand and low (τ) due to ability of firms to supply

[5] See Krugman (1991).

remote distances by central locations. In addition, $(\sigma/(\sigma-1))$ and $(\sigma(1-\mu))$ are reported also because if former is larger than 1, then Turkish manufacturing industry would be subject to increasing returns to scale and if latter is less than 1, high manufacturing share allows for agglomeration of the manufacturing industry in Turkey.

Both models have nice features; however, they pose some econometric problems.[6] First of all, wages and regional incomes are determined simultaneously which may lead to bias in the results. In order to tackle first issue, Hanson (1998 and 2005) used time-difference versions of equations (1) and (2). With such method, he claimed that the unobservable characteristics of region invariant over time such as agricultural land, presence of universities etc. are controlled. Unfortunately, this method causes loss of information which prevents the convergence of data. Despite the best efforts, time-differenced models did not converge for Turkish data hence the results are unavailable to be presented. Another problem is the largest areas can be affected disproportionately by the shocks or there may be shocks specific to larger regions which may affect also smaller regions. To overcome this problem, we use two different samples of regions, first sample with all 12 NUTS1 regions and second sample without Istanbul region, the largest region in terms of income in Turkey. The details of the differences between regions in terms of income are presented in Appendix and in Figure 1 and 2.

There may be also measurement error in distance since not all roads are in the same quality between regions. Hence, better roads lead to shorter distance time which may not be captured by distance measure in kilometers. Therefore, two samples of distance are used, distance of kilometers and distance of travel time in minutes. The details of distance variable are discussed in details in the next section.

In order to estimate equations (1) and (2), non-linear least square methods is applied since both equations are highly non-linear. To get the parameter values, the initial values of the parameters should be placed in the equations. To achieve the convergence and estimation, the results of the previous studies, mostly Garcia Pires (2006) and Farmanesh (2009) for initial parameter values are being used.

[6] See Hanson (1998 and 2005) and Garcia Pires (2006).

4. Data and Geography of Turkey

Turkey is the 18th largest country in terms of population and 37th largest country in terms of land area with distinct history and geography. Turkey is divided into 81 city regions which are governed by central government. With the starting of EU membership process in 2004, Turkish Statistical Office divided Turkey into NUTS1-NUTS2 regions as shown in Table 1.

Given this information, 12 NUTS1 regions are chosen to conduct the spatial analysis of Turkey, due to the limited availability of data for wages. Any other region from Europe or other neighbors of Turkey is not included in the analysis despite the fact that there is considerable economic activity between Turkey and the neighbors and Turkey is integrated to the world economy. Hence this closed-economy framework may be viewed as unsatisfactory; however, similar studies follow the same approach.

Table 1 NUTS1 and NUTS2 Regions in Turkey

NUTS1	**NUTS2**
TR1 Istanbul	TR10 Istanbul
TR2 Batı Marmara	TR21 Tekirdağ, Edirne, Kırklareli TR22 Balıkesir, Çanakkale
TR3 Ege	TR31 Izmir TR32 Aydın, Denizli, Muğla TR33 Manisa, Afyon, Kütahya, Uşak
TR4 Dogu Marmara	TR41 Bursa, Eskişehir, Bilecik TR42 Kocaeli, Sakarya, Düzce, Bolu, Yalova
TR5 Batı Anadolu	TR51 Ankara TR52 Konya, Karaman
TR6 Akdeniz	TR61 Antalya, Isparta, Burdur TR62 Adana, Mersin TR63 Hatay, Kahramanmaraş, Osmaniye
TR7 Orta Anadolu	TR71 Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir TR72 Kayseri, Sivas, Yozgat
TR8 Batı Karadeniz	TR81 Zonguldak, Karabük, Bartın TR82 Kastamonu, Çankırı, Sinop TR83 Samsun, Tokat, Çorum, Amasya
TR9 Dogu Karadeniz	TR90 Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane
TR10 Kuzeydogu Anadolu	TRA1 Erzurum, Erzincan, Bayburt TRA2 Ağrı, Kars, Iğdır, Ardahan
TR11 Ortadogu Anadolu	TRB1 Malatya, Elazığ, Bingöl, Tunceli TRB2 Van, Muş, Bitlis, Hakkari
TR12 Guneydogu Anadolu	TRC1 Gaziantep, Adıyaman, Kilis TRC2 Şanlıurfa, Diyarbakır TRC3 Mardin, Batman, Şırnak, Siirt

The data used in this paper is yearly disposable income for wages, gross value added for GDP, and distance. All data is in NUTS1 region level from years 2006 to 2010. Regarding distance two samples are used. First sample is the distance in kilometers obtained by Turkish Road Association database. Second sample is the distance in travel time in minutes from Google Map. In both sample, two measures of distance are used, simple and extreme. Simple distance is the distance in kilometers between the two largest cities of the two NUTS1 regions where extreme distance is the distance in kilometers assuming that all trade between the regions passes through Istanbul, the largest region, with the presumption that most logistics facilities are located in Istanbul. Simple travel time is the distance in minutes between the largest cities of the two regions and extreme travel time is the distance in minutes with the same assumption of extreme distance. Regarding the distance within the region, we follow Head and Mayer (2006) approximation and use the following formula to compute the region's own distance;

$$D_{ii} = 0.66\sqrt{\frac{Area_i}{\Pi}} \tag{3}$$

Now, we want to briefly present spatial distribution of the key variables in Turkey, wage and GDP where the yearly averages of wage and GDP from 2006 to 2010 are used. For spatial distribution, the value of the variable in region is divided by the value of the same variable's national average by using the following formulas;

$$\frac{w_j}{\overline{w}} \tag{4}$$

$$\frac{GDP_j}{\overline{GDP}} \tag{5}$$

where in equation (4), w_j is the average disposable income per worker in region j for period 2006-2010 and $\overline{w}$ is the national average of disposable income for same period. In equation (5), GDP_j is the average GDP of region j and $\overline{GDP}$ is the national average of GDP for 2006-2010 periods.

The results of this analysis are in Figure 1 and Figure 2. The fact that can be observable at the beginning is the existence of spatial differences of wages and GDP within Turkey. The highest wage is in Istanbul region and lowest wage is in Guneydogu Anadolu region. The wages are higher in regions in the west part of Turkey but the differences are not very large. When the spatial distribution of GDP is the case, more diversity between regions is observable. Again, Istanbul has the highest GDP and west part has higher GDP comparing to the east part but now Kuzeydogu Anadolu region has the lowest value for GDP.

These descriptive statistics pose interesting results. Istanbul region has the highest GDP and wage as predicted by theory where higher economic activity leads to higher wages, but Guneydogu Anadolu region has the lowest wage but Kuzeydogu Anadolu region has the lowest GDP, not perfectly in line with theory. In general, the west part of Turkey has higher economic activity and higher wages and east part of Turkey has lower economic activity and lower wages. This general observation may suggest the validity of the theory by Krugman (1993) and Helpman (1954), but it is necessary to conduct the econometric analysis for stronger support. The next section presents the results of these analyses.

5. Results

In this section, the estimation results of both model, Market Potential Function and Krugman, are presented in two sub-sections. In all estimations, STATA is used. As discussed in section 2, two samples of region and distance are used, the latter with two measures. The all estimations are done firstly for all period of five years by using full panel data and reported under period section of the tables and secondly for each single year. Unfortunately, both models do not converge to attainable results when time-difference method is used, possibly due to information loss.

Figure 1 Spatial Distribution of Wages in Turkey

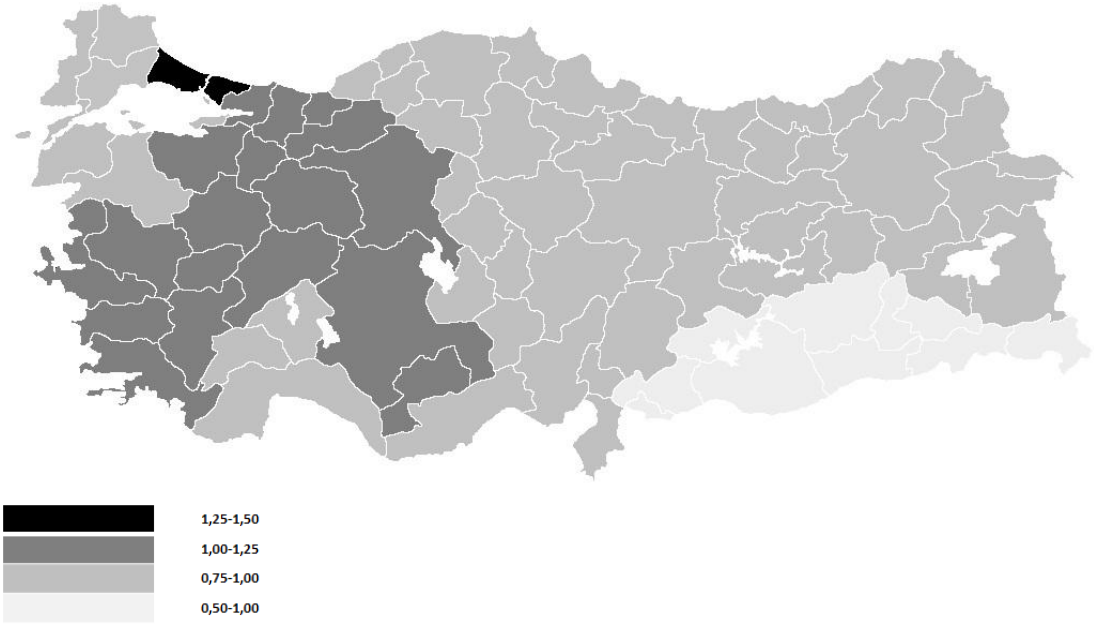
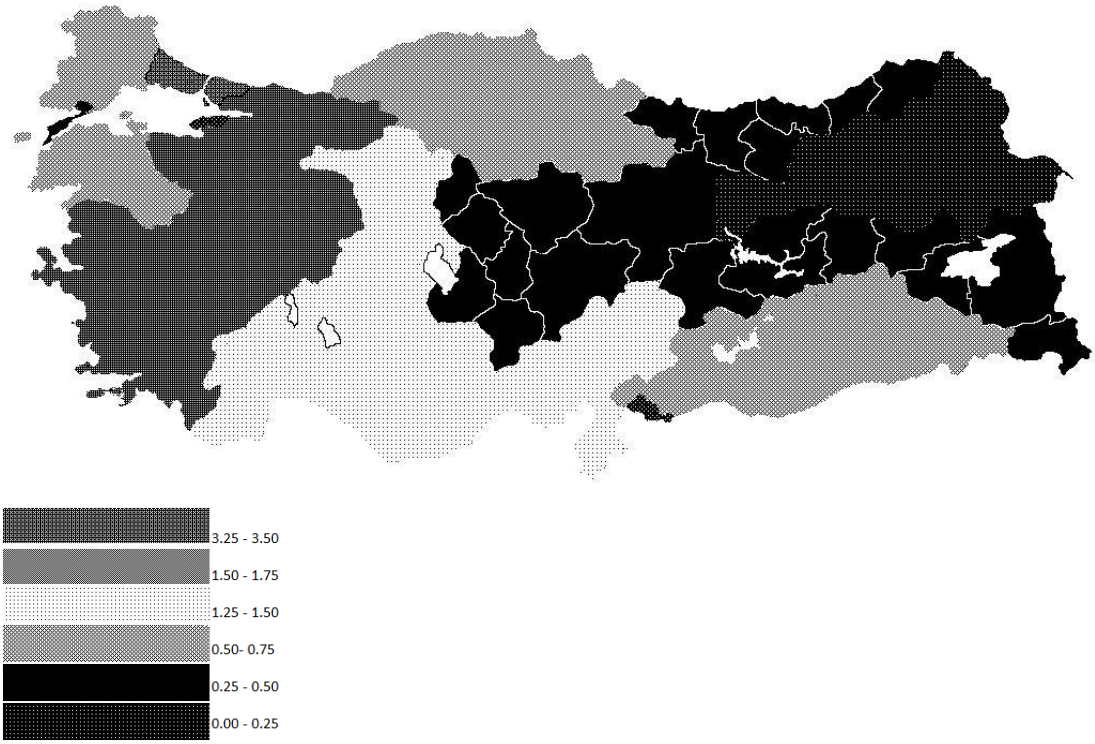


Figure 2 Spatial Distribution of GDP in Turkey



5.1. Market Potential Function

This sub-section presents the results of Harris (1954) Market Potential Function. The simple distance with all regions and restricted regions (Table 2 and Table 3), extreme distance with all regions and restricted regions (Table 4 and Table 5), simple travel time with all regions and restricted regions (Table 6 and Table 7) and extreme travel time with all regions and restricted regions (Table 8 and Table 9) are presented, respectively.

The general overview of the results indicates that the parameter (α), the effect of market potential on wages, is always positive in all estimations through Table 1-Table 8 as predicted by theory. In simple distance, the range of (α) is between 0.03 and 0.19. It shows that higher consumer demand increases the nominal wages in a given region. The other parameter estimated by market potential function is (β) which shows the effect of distance from consumer markets on regional wages. As predicted by theory, (β) is always positive in all estimations, ranging from 0.001 to 0.09. This positive relation indicates that increasing distance from consumer markets reduces the nominal wages.

Table 2 Market Potential Function: 12 Regions and Simple Distance

Parameters	Period	2006	2007	2008	2009	2010
θ	9.0484*	9.008*	9.5989*	9.6487*	9.2208*	9.1057*
	(0.5926)	(1.3598)	(1.2688)	(1.0613)	(1.1341)	(0.9217)
α	0.0641*	0.0556	0.0348	0.0341	0.0597	0.0641
	(0.0305)	(0.0704)	(0.0650)	(0.0540)	(0.0582)	(0.0472)
β	0.0419*	0.0534	0.0836	0.0863	0.0441	0.0349
	(0.0249)	(0.0810)	(0.1759)	(0.1535)	(0.0530)	(0.0329)
Adjusted R^2	0.33	0.28	0.28	0.40	0.33	0.40

The regions are NUTS1 classification of Turkish Statistical Office. Definition of simple distance is given in section 3. Standard errors are reported in parentheses.
**Statistically significant*

The closer analysis of each estimation shows that period analysis provides more reliable results than the year analysis due to significance and higher adjusted R^2. Table 2 and Table 3 exhibit similar results showing that the largest region, Istanbul region, does not affect the overall results. We find the similar results in extreme distance analysis presented in Table 4 and Table 5. In addition, comparison of simple and extreme distance indicate that the highest (β) value and the lowest (α) obtained in simple distance analysis which shows that increasing distance lowers the effect of distance and promotes the effect of consumer demand. When we look at the yearly results in simple distance, initially we see the decreasing effect of

consumer demand on wages but after 2008 this effect is increasing. The possible explanation is Turkish economy suffered low growth during 2007 and 2008 because of the financial crisis and then showed high growth rates in 2009 and 2010 pointing the increasing regional income and consumer demand has stronger effect on wages which is in line with the theory.

Table 3 Market Potential Function: 11 Regions and Simple Distance

Parameters	Period	2006	2007	2008	2009	2010
θ	9.1080*	8.945*	9.6041*	9.6498*	9.2580*	-46.2306
	(0.6153)	(1.3279)	(1.3414)	(1.1209)	(1.2133)	
α	0.0597*	0.0719	0.0305	0.0304	0.0553	2.7680*
	(0.0328)	(0.0711)	(0.0707)	(0.0586)	(0.0647)	(0.0079)
β	0.0432	0.0585	0.0823	0.0845	0.0434	0.0002*
	(0.0302)	(0.0673)	(0.2101)	(0.1799)	(0.0638	(0.0001)
Adjusted R^2	0.09		-0.09	-0.02	-0.03	0.27

The regions do not include Istanbul region, the largest region in Turkey in terms of GDP. Definition of simple distance is given in section 3. Standard errors are reported in parentheses.
**Statistically significant.*

Table 4 Market Potential Function: 12 Regions and Extreme Distance

Parameters	Period	2006	2007	2008	2009	2010
θ	7.0549*	6.669*	7.4512*	8.1417*	7.3520*	7.7675*
	(0.4583)	(1.0091)	(0.9523)	(0.9218)	(0.8249)	(0.6936)
α	0.1636*	0.1712*	0.1421*	0.1105*	0.1539*	0.1318*
	(0.0246)	(0.0549)	(0.0506)	(0.0475)	(0.0436)	(0.0361)
β	0.0084*	0.0072	0.0099	0.0181	0.0097	0.0109
	(0.0029)	(0.0054)	(0.0079)	(0.0139)	(0.0061)	(0.0065)
Adjusted R^2	0.47	0.46	0.45	0.52	0.58	0.63

The regions do not include Istanbul region, the largest region in Turkey in terms of GDP. Definition of extreme distance is given in section 3. Standard errors are reported in parentheses.
**Statistically significant*

Table 5 Market Potential Function: 11 Regions and Extreme Distance

Parameters	Period	2006	2007	2008	2009	2010
θ	6.5263*	7.5025*	7.1837*	8.1626*	6.9953*	7.4742*
	(0.6789)	(1.1458)	(1.4343)	(1.1542)	(1.2777)	(0.9373)
α	0.1991*	0.1204*	0.1562*	0.1113	0.1811*	0.1452*
	(0.0393)	(0.0645)	(0.0842)	(0.0657)	(0.0727)	(0.0545)
β	0.009*	0.0048*	0.008	0.0196	0.0116	0.0077
	(0.0034)	(0.0022)	(0.0083)	(0.0184)	(0.0087)	(0.0055)
Adjusted R^2	0.32		0.14	0.15	0.35	0.35

The regions do not include Istanbul region, the largest region in Turkey in terms of GDP. Definition of extreme distance is given in section 3. Standard errors are reported in parentheses.
**Statistically significant*

When distance in travel time in minutes is used, the results from Table 6 to Table 9 are obtained. Again, the period analysis exhibits higher adjusted R^2 which shows that more reasonable results are obtained in the period analysis. As one can see, the coefficient of constant cannot be estimated well in Table 6 and Table 7. The estimated value of the parameters (α) and (β) displayed huge fluctuations between years which is not very plausible. However, when we look at the period analysis of travel time, we see that the parameter (α) has higher value than the distance in kilometers showing the stronger effect of consumer demand on nominal wages. On the other hand, parameter (β) has lower value when travel time used which means distance has smaller effect on nominal wages in a given region.

Table 6 Market Potential Function: 12 Regions and Simple Travel Time

Parameters	Period	2006	2007	2008	2009	2010
θ	-10.4722* (3.5063)	-65.3815	-45.4891	-11.3790 (339.74)	-63.2963	-11.2876 (192.83)
α	1.0059* (0.1709)	3.7108* (0.0098)	2.7208* (0.0096)	1.0449 (16.5242	3.5773* (0.0081)	1.0423 (9.3177)
β	0.0009* (0.0002)	0.0003* (0.0001)	0.0003* (0.0001)	0.0007 (0.1085)	0.0003* (0.0001)	0.0008 (0.0072)
Adjusted R^2	0.51	0.36	0.22	0.11	0.42	0.30

The regions are NUTS1 classification of Turkish Statistical Office. Definition of simple travel time is given in section 3. Standard errors are reported in parentheses.
**Statistically significant.*

Table 7 Market Potential Function: 11 Regions and Simple Travel Time

Parameters	Period	2006	2007	2008	2009	2010
θ	-9.7035* (3.3458)	-62.6700	-34.9166	-25.1077	-59.0938	-41.6821
α	0.9771* (0.1656)	3.6292* (0.0127)	2.2312* (0.0115)	1.7318* (0.0098)	3.4216* (0.0098)	2.5434* (0.0073)
β	0.0001* (0.0002)	0.0003* (0.0002)	0.0002* (0.0002)	0.0003 (0.002)	0.0003* (0.0001)	0.0003* (0.0001)
Adjusted R^2	0.45	0.17	0.03	0.01	0.25	0.26

The regions do not include Istanbul region, the largest region in Turkey in terms of GDP. Definition of simple travel time is given in section 3. Standard errors are reported in parentheses.
**Statistically significant.*

Table 8 Market Potential Function: 12 Regions and Extreme Travel Time

Parameters	Period	2006	2007	2008	2009	2010
θ	-10.6258* (2.9568)	6.024 (3.6907)	7.6755* (1.5053)	7.9886* (1.2163)	-41.9091	-35.4729
α	1.0160* (0.1442)	0.1957 (0.185)	0.1201 (0.0776)	0.1041 (0.0629)	2.5409* (0.0059)	2.2126* (0.0051)
β	0.0006* (0.0001)	0.0042 (0.0047)	0.0060 (0.0047)	0.0064 (0.0047)	0.0003* (0.0001)	0.0003* (0.0001)
Adjusted R^2	0.66	0.59	0.36	0.36	0.62	0.60

The regions are NUTS1 classification of Turkish Statistical Office. Definition of extreme travel time is given in section 3. Standard errors are reported in parentheses.
**Statistically significant.*

Table 9 Market Potential Function: 11 Regions and Extreme Travel Time

Parameters	Period	2006	2007	2008	2009	2010
θ	-9.5946* (2.9299)	7.6994* (0.8262)	-31.1221	8.1956 (1.5180)	-9.9496 (201.50)	-11.6227 (327.75)
α	0.9781* (0.1451)	0.1129* (0.0469)	2.0503* (0.0101)	0.0905 (0.0806)	1.0001 (9.9529)	1.0724 (16.0795)
β	0.0005* (0.0001)	0.0074* (0.0027)	0.0002* (0.0001)	0.0047 (0.0046)	0.0006 (0.0057)	0.0004 (0.0059)
Adjusted R^2	0.58	0.77	0.25	0.13	0.41	0.39

The regions do not include Istanbul region, the largest region in Turkey in terms of GDP. Definition of extreme travel time is given in section 3. Standard errors are reported in parentheses.
**Statistically significant*

Now, the results of previous studies for different countries and the comparison of the results obtained in this paper with those for Harris (1954) market potential function are represented. Table 10 provides information for such comparison. We only include the results of analyses with distance in kilometers for reliable comparison.

The parameter showing the effect of consumer demand on wages (α) for Turkey is lower than USA, Belgium and Iran and it is in the same interval with Germany and Spain. Regarding the parameter relating effect of distance on wages (β) is only lower than Belgium. However, parameter (β) of Turkey has the highest interval between low and high values. In general, it is possible to say that the effect of consumer demand and distance on wages in Turkey is very similar to those in Spain and Germany.

Table 10 Overview of the Similar Studies for Harris (1954) Market Potential Function

Article	Country	α	β
Hanson (2005)	USA	0.24 to 0.43	Not comparable
Brakman et al. (2004)	Germany	0.049	0.092
Roos (2001)	W. Germany	0.02 to 0.08	0.03 to 0.12
De Bruyne (2002)	Belgium	0.26	0.65
Farmanesh (2009)	Iran	0.48 to 0.62	0.01 to 0.02
Garcia (2006)	Spain	0.08 to 0.24	0.008 to 0.032
This Article	Turkey	0.03 to 0.19	0.001 to 0.09

In summary, the nominal wages in Turkey are positively correlated with the distance-weighted sum of income in surrounding regions as predicted by Harris (1954) market potential hypothesis. In addition, our results are comparable and in line with previous studies.

5.2. Krugman Model

In this sub-section, the results of Krugman (1993) Model are shown. In simple distance analysis with all regions and restricted regions, again, the period analysis produces more reasonable results than yearly analysis. The parameter elasticity of substitution (σ) is higher than 1 in Table 11 and Table 12 as suggested by theory. However, the value of parameter (σ) ranges from 67.0035 to 65.8924 in period analysis, and from 52.5551 to 80.5184 in yearly analysis, much higher than the values found in previous studies.[7] Hence, the price-cost margin (σ/(σ-1)) becomes very close to 1, ranging from 1.013 to 1.019. This shows that returns in manufacturing industry of Turkey is very close to constant returns to scale since the cost-price margin ratio is slightly higher than 1. When the extreme distance is used in Krugman model, the parameter (σ) is ranged from 70.0651 to 98.6631 and the cost-price margin ratio is ranged from 1.010 to 1.014 which indicates constant returns to scale of manufacturing industry of Turkey. At first place, these results seem awkward but the structure of Turkish manufacturing industry in some sectors such as textile and automotive is partly contract-manufacturing type where such structure may not allow increasing returns to scale. Unfortunately, the parameter (σ) is statistically not significant in all estimations.

The trade cost parameter (τ) is higher than zero in simple and extreme distance analysis and ranged from 0.0001 to 0.0016 as expected by theory. This result shows that increasing distance from consumer markets has decreasing effect on nominal wages in a given region. However, this effect is very small considering the previous studies. The parameter showing the share of manufactured goods in expenditures (μ) should be between 0 and 1

[7] See Brakman et al. (2004), De Bruyne (2003) and Garcia Pires (2006).

regarding to the theory. Such values are attained in period analysis, 2006 and 2010 year analysis of simple distance. In all other estimations of distance, the value of (μ) comes out larger than 1, which is not consistent with theory. Interestingly, the estimation of (μ) generally showed similar problems in other studies.[8] The possible explanation of this inconsistent result with theory is the endogeneity problem posed by the model. If the results from time-differenced Krugman model were obtained, it would be possible to show whether endogeneity problem is removed or not but unfortunately such results were unable to attain.

Table 11 Krugman Model: 12 Regions and Simple Distance

Parameters	Period	2006	2007	2008	2009	2010
θ	-0.0393	-0.8454	0.7158	1.2783	0.2839	-0.5562
	(0.6652)	(2.1772)	(2.5644)	(1.6944)	(2.0947)	(2.2874)
σ	67.0035	64.1386	73.8401	77.734	69.6157	62.2982
	(91.11)	(236.66)	(356.52)	(271.88)	(309.69)	(244.32)
μ	0.9865*	0.9056*	1.0712*	1.1328*	1.0204*	0.9161*
	(0.0718)	(0.1964)	(0.3363)	(0.2453)	(0.2479)	(0.2233)
τ	0.0014*	0.0016*	0.0012*	0.0015*	0.0012*	0.0019*
	(0.0002)	(0.0004)	(0.0007)	(0.0005)	(0.0004)	(0.0005)
σ/(σ-1)	1.015	1.0158	1.0137	1.013	1.015	1.016
σ(1-μ)	0.9045	6.0547	-5.2574	-10.3231	-1.4202	5.2268
Adjusted R^2	0.71	0.44	0.37	0.49	0.43	-1.85

The regions are NUTS1 classification of Turkish Statistical Office. Definition of simple distance is given in section 3. Standard errors are reported in parentheses.
**Statistically significant*

Table 12 Krugman Model: 11 Regions and Simple Distance

Parameters	Period	2006	2007	2008	2009	2010
θ	-0.4092	-1.1682	-0.0212	1.4439	0.3107	-2.4755
	(0.8249)	(2.7854)	(2.9057)	(2.3839)	(2.7861)	(3.5897)
σ	65.8924	62.9515	69.1791	80.5184	70.5147	52.5551
	(102.95)	(278.13)	(369.39)	(334.30)	(378.13)	(163.07)
μ	0.9527*	0.8778*	0.9881*	1.1527*	1.0206*	0.7541*
	(0.08100	(0.2288)	(0.3205)	(0.3394)	(0.3141)	(0.2219)
τ	0.0013*	0.0016*	0.001*	0.0015*	0.0011*	0.0019*
	(0.0002)	(0.0005)	(0.0004)	(0.0008)	(0.0004)	(0.0007)
σ/(σ-1)	1.016	1.016	1.015	1.013	1.014	1.019
σ(1-μ)	3.1167	7.6927	0.8232	-12.2952	-1.4526	12.9233
Adjusted R^2	0.68	0.55	-0.66	0.25	0.16	-7.65

The regions do not include Istanbul region, the largest region in Turkey in terms of GDP. Definition of simple distance is given in section 3. Standard errors are reported in parentheses.
**Statistically significant*

[8] See De Bruyne (2002) and Brakman et al (2004).

Table 13 Krugman Model: 12 Regions and Extreme Distance

Parameters	Period	2006	2007	2008	2009	2010
θ	1.2685*	0.9813	2.2546*	2.8275*	2.1215*	3.3046*
	(0.2839)	(0.6738)	(0.9055)	(0.7846)	(0.9052)	(1.2366)
σ	76.3942	77.6840	86.9791	92.6590	84.8539	98.6631
	(66.91)	(169.66)	(231.09)	(221.37)	(236.37)	(381.260
μ	1.1268*	1.0999*	1.2644*	1.3531*	1.2470*	1.4596*
	(0.0431)	(0.1042)	(0.1735)	(0.1767)	(0.17760	(0.3334)
τ	0.0014*	0.0012*	0.0016*	0.0014*	0.0014*	0.0013*
	(0.0001)	(0.0002)	(0.0003)	(0.0003)	(0.0003)	(0.0004)
σ/(σ-1)	1.013	1.013	1.021	1.011	1.012	1.01
σ(1-μ)	-9.6868	-7.7706	-22.9973	-32.7179	-20.9589	-45.3456
Adjusted R^2	0.84	0.86	0.69	0.14	0.75	0.47

The regions do not include Istanbul region, the largest region in Turkey in terms of GDP. Definition of extreme distance is given in section 3. Standard errors are reported in parentheses.
**Statistically significant.*

Table 14 Krugman Model: 11 Regions and Extreme Distance

Parameters	Period	2006	2007	2008	2009	2010
θ	0.3129*	0.5877	0.5240	0.7210	0.6391	0.0954
	(0.1648)	(0.4408)	(0.4748)	(0.5948)	(0.5290)	(0.4237)
σ	70.7496	75.4385	72.8685	74.7847	73.2861	70.0651
	(33.68)	(109.43)	(82.93)	(92.6932)	(104.39)	(58.66)
μ	1.0240*	1.0547*	1.0416*	1.0696*	1.0613*	1.0105*
	(0.0192)	(0.0571)	(0.0570)	(0.0759)	(0.0696)	(0.0495)
τ	0.0011*	0.0012*	0.0001*	0.0011*	0.0011*	0.0006*
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
σ/(σ-1)	1.014	1.014	1.014	1.014	1.014	1.014
σ(1-μ)	-1.6980	-4.1265	-3.0313	-5.2050	-4.4924	-0.7357
Adjusted R^2	0.98		0.68	0.94	0.97	0.97

The regions do not include Istanbul region, the largest region in Turkey in terms of GDP. Definition of extreme distance is given in section 3. Standard errors are reported in parentheses.
**Statistically significant.*

The travel time analysis of Krugman model exhibits similar results to the distance in kilometers. The parameter (σ) is ranged from 43.8465 to 86.3802, (τ) is ranged from 0.0004 to 0.0038 and (μ) is ranged from 0.8285 to 1.2562, the lowest and the highest, respectively. But the main problem in these analyses is that adjusted R^2 turns out be negative in most cases which shows that the model does not follow the trend in data. Hence, travel time in minutes as a proxy for distance is not applicable.

Table 15 Krugman Model: 12 Regions and Simple Travel Time

Parameters	Period	2006	2007	2008	2009	2010
θ	-0.4330	-1.748	-0.4417	0.1447	-0.5179	0.7603
	(0.8539)	(2.1822)	(4.6544)	(2.7619)	(4.6691)	(2.7916)
σ	64.3308	58.7594	65.0269	69.5482	62.7874	72.9450
	(105.33)	(222.07)	(395.08)	(265.36)	(372.29)	(443.33)
μ	0.9465*	0.8285*	0.9416*	1.0119*	0.9188*	1.0753*
	(0.0866)	(0.1725)	(0.4699)	(0.3196)	(0.4476)	(0.3968)
τ	0.0013*	0.0024*	0.0012*	0.0013*	0.0013*	0.0015*
	(0.0002)	(0.0004)	(0.0004)	(0.0003)	(0.0003)	(0.0004)
σ/(σ-1)	1.016	1.017	1.016	1.015	1.016	1.014
σ(1-μ)	3.4417	10.0772	3,7976	-0.8276	5.0983	-5.4928
Adjusted R^2	0.17	0.25	-1.55	0.17	-5.96	0.13

The regions are NUTS1 classification of Turkish Statistical Office. Definition of simple travel time is given in section 3. Standard errors are reported in parentheses.
**Statistically significant*

Table 16 Krugman Model: 11 Regions and Simple Travel Time

Parameters	Period	2006	2007	2008	2009	2010
θ	-0.1603	-1.041	1.4297	1.6648	0.2019	0.8864
	(1.0759)	(2.4227)	(3.6434)	(3.8288)	(2.6251)	(4.0626)
σ	67.4149	62.9327	80.7415	83.3516	69.2380	74.7727
	(121.33)	(287.49)	(528.05)	(428.85)	(456.18)	(425.87)
μ	0.9751*	0.8775*	1.1557*	1.1938*	1.0018*	1.0791*
	(0.1076)	(0.2094)	(0.5337)	(0.5836)	(0.3073)	(0.5391)
τ	0.0014*	0.0024*	0.0014*	0.0011*	0.0019*	0.0016*
	(0.0002)	(0.0004)	(0.0007)	(0.0004)	(0.0005)	(0.0005)
σ/(σ-1)	1.015	1.016	1.013	1.012	1.015	1.014
σ(1-μ)	1.6786	7.7093	-12.5715	-16.1535	-0.1246	-5.9145
Adjusted R^2	0.28	-0.72	-0.72	-0.79	-0.68	-1.37

The regions do not include Istanbul region, the largest region in Turkey in terms of GDP. Definition of simple travel time is given in section 3. Standard errors are reported in parentheses.
**Statistically significant.*

Table 17 Krugman Model: 12 Regions and Extreme Travel Time

Parameters	Period	2006	2007	2008	2009	2010
θ	0.6780	8.0569	2.1395	1.7695	2.1381	1.8643
	(0.7121)	(1.2533)	(3.6882)	(3.3977)	(4.0820)	(4.2067)
σ	71.8463	61.5781	86.3802	82.3531	85.4716	82.3597
	(118.17)	(197.99)	(621.48)	(465.47)	(791.99)	(802.17)
μ	1.0589*	0.8689*	1.2556	1.2010*	1.2562	1.2160
	(0.0949)	(0.1157)	(0.7011)	(0.5745)	(0.8119)	(0.7859)
τ	0.0014*	0.0038*	0.0011*	0.0012*	0.0011*	0.0011*
	(0.0001)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
σ/(σ-1)	1.014	1.017	1.012	1.012	1.012	1.012
σ(1-μ)	-4.2317	8.1222	-22.0788	-16.5530	-21.8978	-17.7897
Adjusted R^2	0.55	0.01	-0.06	0.05	0.21	-0.14

The regions are NUTS1 classification of Turkish Statistical Office. Definition of extreme travel time is given in section 3. Standard errors are reported in parentheses.
**Statistically significant.*

Table 18 Krugman Model: 11 Regions and Extreme Travel Time

Parameters	Period	2006	2007	2008	2009	2010
θ	-1.0261	0.3904	1.6817	-0.5387	0.2065	2.4129
	(0.8798)	(3.2376)	(3.8589)	(4.5659)	(2.7269)	(3.3616)
σ	56.6468	72.8462	81.5908	64.8754	68.4643	43.8465
	(60.5974)	(376.05)	(501.95)	(217.66)	(280.69)	(102.73)
μ	0.8170*	1.0180*	1.1680*	0.9259*	0.9905*	1.3556*
	(0.0607)	(0.3982)	(0.6058)	(0.4259)	(0.3078)	(0.7106)
τ	0.0006*	0.0006*	0.0006*	0.0005*	0.0006*	0.0004*
	(0.0001)	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
σ/(σ-1)	1.018	1.014	1.012	1.016	1.015	1.023
σ(1-μ)	10.3664	1.3112	-13.7073	4.8073	0.6504	-15.5918
Adjusted R^2	-32.64	-1.584	-4.20	-5.64	-5.62	0.67

The regions do not include Istanbul region, the largest region in Turkey in terms of GDP. Definition of extreme travel time is given in section 3. Standard errors are reported in parentheses.
**Statistically significant*

The comparison of the parameter values estimated in this paper and previous papers are shown in Table 19. Hanson (2005) and Garcia (2006) favored time differences and Roos (2001), Brakman et al. (2004) and De Bruyne (2002) favored level specification methods. The latter one contains more relevant information about wages in addition Krugman model, but the former explain much of the differences in wages by using Krugman model. This paper also uses level specification due to estimation issues.

The most significant parameter between this paper and the other papers is elasticity of substitution (σ) which is around 10 to 20 times higher in this study than the previous studies. It means that consumers in Turkey do not value variety as much as in other countries. Regarding price-cost margin ratio (σ/(σ-1)), the industries in other countries exhibit increasing returns to scale where Turkish manufacturing industry is almost constant returns to scale. A provocative interpretation of such results would be that Turkey and EU have very strong trade relationships and in some sectors EU firms ask Turkish firms to manufacture their brand name products and such business relationships contribute to constant returns to scale structure of Turkish industries.

The trade cost parameter (τ) is found always significant in this paper and generally is similar to the values obtained in previous papers. However, since different types of measures were used to construct distance data in the papers it may be complicated to make such comparison. The most problematic parameter of Krugman model in empirical applications is the share of manufactured goods in expenditures (μ) because the theory states that the value of (μ) should be between 0 and 1 but in most papers the value is out of this range. For example in Hanson (2005) paper, the (μ) is 0.91 to 0.98 indicating very little expenditure on

housing. In Garcia (2006) paper, in time difference he obtains the most reasonable (μ) but when levels specification used the results are very bizarre. In this paper, the value of (μ) is 0.75 at lowest and 1.46 at highest which is consistent with the previous studies but not consistent with the theory.

Table 19 Overview of the Similar Studies for Krugman (1993) Augmented Market Potential Function

Article	Country	σ	τ	μ	σ/(σ-1)
Hanson (2005)	USA	4.9 to 7.6	1.6 to 3.2	0.91 to 0.98	1.15 to 1.26
Brakman et al. (2004)	Germany	3.1 to 4.9	-0.001 to 0.01	0.54 to 12.48	1.25 to 1.48
Roos (2001)	W. Germany	6.2	0.003	0.8	1.19
De Bruyne (2002)	Belgium	5.5	0.003	1.62	1.22
Farmanesh (2009)	Iran	7	0.001 to 0.017	0.98 to 1	1.14 to 1.15
Garcia (2006)	Spain	4.26 to 5.18	0.001 to 0.003	-2 to -7 0.85 to 0.88*	1.23 to 1.3
This Article	Turkey	52.56 to 82.08	0.001 to 0.002	0.75 to 1.46	1.01 to 1.02

** Results are obtained by time difference method*

6. Conclusion

In this paper, we estimate Harris (1954) market potential function and Krugman (1993) new economic geography model to the NUTS1 regions of Turkey. The estimates of Harris (1954) model generally showed good fit of Turkish data to the model. The results indicate that wages are higher in a region when the region is closer to the markets with high consumer demand and distance has effect on nominal wages, as predicted by theory.

The estimates of Krugman (1993) model show almost constant returns of scale nature of manufacturing industry in Turkey, low trade costs and high expenditure share of manufacturing goods in consumers' expenditures. As a result, the agglomeration of industries in Turkey is subject to low trade costs and large spending of consumers to industrialized goods.

There may several weaknesses in this paper which may be overlooked. First, there are differences also within regions itself because we use NUTS1 regions which consist of cities with different GDP levels but this is due to the unavailability of wage data. Second, the geography of wages may be explained by other reasons because time-differenced versions of both models did not converge possibly due to information loss. Therefore, the intercept terms may contain lot of relevant information other than distance and income. Third, the

heterogeneity of industries and trade costs are not taken into account, and trade costs are assumed constant across regions.

There are common and different results this paper shares with the previous papers. First of all regarding Harris market potential function, the effect of consumer demand in Turkey share similar values, on average, for Germany done by Brakman et al. (2004) and for Spain done by Garcia (2006). However, considering the effect of distance on wages only the paper of Bruyne (2002) for Belgium shows stronger effect than what this paper obtains for Turkey. In general, the common point of the all previous papers estimating the Harris market potential function and this paper is the well fit of data to the model.

Considering the previous work using Krugman (1993) model and this paper, the interesting common result is that the share of expenditure on manufactured goods come out more than 1 in all papers except Garcia (2006); however, this share is not consistent with the theory. The significant difference of this paper and the previous ones is the low elasticity of substitution in Turkish data showing that consumers in Turkey do not value variety as much as the consumers do in other countries.

The results of this paper also possess similar findings of the previous works done for Turkish data. As Karahasan et al. (2011), the market potential of regions are successful and important to explain the dispersion of wages across regions in Turkey. It also adds to the existing literature such that trade costs and expenditure type of consumers partly explains the agglomeration of industries where Akgungor and Falcioglu (2005) do not find evidence for concentration of industries and use economies of scale as a reason of concentration where this paper do not find such evidence.

In any case, the results of both estimations possess interesting and novel results for Turkish economy. The most intriguing is the parameter (σ) which is substantially higher than the other countries which leads to another important value, price-cost margin ($\sigma/(\sigma-1)$) ratio. This ratio ($\sigma/(\sigma-1)$) gives idea about the returns of scale, and previous studies generally it was higher than 1.15 which suggests the increasing returns of scale. For Turkish industries, this ratio becomes 1.01 to 1.02 and suggests constant returns to scale. When we consider the fact that significant number of the firms in Turkey is small to medium size enterprises, they may not be subject to increasing returns to scale. Hence such structure of manufacturing industry prevented the higher agglomeration of industries in Turkey. Another interesting parameter is (α), the effect of consumer demand on wages, because it turns out be very similar to those of

Spain and Germany. So, considering also the similar effect of distance on wages (β), it is possible to say that Turkey has similar distance sensitive trade structure like Germany and Spain. The reasons of such similarity could be the similar transportation systems and infrastructure in those countries or similar geographical lands. Since there were huge road infrastructure investments in Turkey between 2006 and 2010, these investments helped Turkey to have the well-developed and efficient road infrastructure like in Germany.

This study can be extended in several ways for further research. First, the data for NUTS2 regions of Turkey can be employed for the estimation of the both models. Since NUTS2 regions are more diverse and more regionalized, these facts would increase the reliability of data and allow capturing the effect of distance and trade costs on economic activity in Turkey. Second, considering the rapid increasing of trade relation of Turkey with Iraq and Iran over the last years, the related regions of those countries can be also added to the estimation. This would give more accurate picture for Turkey, especially for Southern Eastern region.

To summarize, this paper is the first paper employing non-linear models on Turkish data. The results suggest that relative low effect of consumer demand on wages comparing to other countries would help wage equalization between regions in Turkey and reduce internal migration. Turkey experienced huge internal migration flows in the previous decades; however, such flows did not appear in the last decade. The conclusion from this paper is the constant returns to scale type industries in Turkey lowers the incentives for migration.

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APPENDIX

Table A The share of GVA (Gross Value Added) by regions in Turkey

	GVA at Current Price				Share of GVA				Share of Population			
	2007	**2008**	**2009**	**2010**	**2007**	**2008**	**2009**	**2010**	**2007**	**2008**	**2009**	**2010**
Country	**754.324.540**	**854.585.213**	**864.449.688**	**980.547.017**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Istanbul	210.163.922	236.293.086	234.357.209	263.657.981	27,86	27,65	27,11	27,42	17,81	17,75	17,80	17,98
Bati Marmara	35.190.003	41.681.546	41.486.175	47.401.703	4,67	4,88	4,80	4,85	4,32	4,35	4,31	4,29
Ege	103.764.833	117.628.172	118.231.119	133.943.645	13,76	13,76	13,68	13,83	13,17	13,12	13,12	13,15
Dogu Marmara	96.172.527	109.246.730	107.413.140	120.141.970	12,75	12,78	12,43	12,57	9,09	9,20	9,24	9,28
Bati Anadolu	81.711.257	93.055.097	96.946.131	107.573.883	10,83	10,89	11,21	11,34	9,42	9,44	9,48	9,52
Akdeniz	79.037.989	88.942.963	91.085.069	105.544.678	10,48	10,41	10,54	10,66	12,62	12,66	12,75	12,78
Orta Anadolu	29.297.485	32.998.821	33.824.690	38.369.310	3,88	3,86	3,91	3,96	5,35	5,30	5,28	5,22
Bati Karadeniz	36.893.571	41.832.715	41.408.081	46.223.366	4,89	4,90	4,79	4,85	6,34	6,26	6,22	6,13
Dogu Karadeniz	19.576.656	22.600.000	22.609.256	25.616.791	2,60	2,64	2,62	2,65	3,53	3,51	3,48	3,41
Kuzeydogu Anadolu	11.343.086	12.815.047	13.903.012	16.214.581	1,50	1,50	1,61	1,63	3,13	3,08	3,03	2,99
Ortadogu Anadolu	17.482.314	20.055.723	22.031.642	25.012.938	2,32	2,35	2,55	2,58	5,04	5,06	5,01	4,95
Guneydogu Anadolu	33.690.897	37.435.313	41.154.164	50.846.171	4,47	4,38	4,76	4,82	10,16	10,28	10,28	10,30

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