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Do Consumption Behaviors Converge ?
A Regional Demand Side Analysis of Convergence Clubs

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Abstract

The rapid progress of information and communication technologies and the improvements in road and air transport have increased not only the income levels but also the interaction of households with each other. Differences in consumption behaviors of the households across regions may be because of their income differences, if not due to their preferences. This study aims to investigate whether consumption behaviors converge together with income levels. For that purpose, we tried to identify the asymptotically perfect convergence clubs in household expenditures on 12 groups of goods and services as well as in their incomes for 26 NUTS-2 Turkish regions. The empirical results demonstrate a high number of convergence clubs, indicating a low level of convergence across the regions in terms of both consumption groups and income.

Keywords: Asymptotically Perfect Convergence Clubs, Consumption Behaviors, Income, Turkish Regions

JEL: C01, D12, N90, R12, R22

1. Introduction

In recent years, information and communication technologies have developed very rapidly. This is coupled with the remarkable improvements in transports. Not only the labor but also the other factors of production have become very mobile, facilitating the increases in incomes in all regions. At the same time, the interactions among households in different regions have increased over time, leading to the convergence of the consumption habits. Convergence of the consumption patterns might indicate the reduction of the disparities of income among the regions. There are a large number of studies on income convergence while relatively less studies on the interactions among the households. Few of them to cite are Baumol (1986), Hobijn & Franses (2000), Carlino & Mills (1993) and Durlauf & Johnson (1995).

Most of the existing studies test whether or not the poorer regions converge to relatively richer regions in terms of per capita income (production). In other words, they mainly focus on the supply side of regional disparities. This leads to a huge gap in the literature in terms of demand side analyses.

In this study we test the existence of the asymptotically perfect convergence and emergence of convergence clubs, developed by Bernard & Durlauf (1995), among the Turkish regions. Demand side of the convergence will be tested by using the expenditure data while supply side of the convergence will be tested by income data. Annual data are compiled for the expenditures on 12 groups of goods and services and income for 26 NUTS-2 regions, covering the period from 2004 and 2011 and the period from 2005 and 2013, respectively. We employ the methodology developed by Hobijn & Franses (2000). This method is based on clustering algortihm and it enables us to make endogenous selection of the converging regions. Thus we will try to identify the convergence clubs and the regions which are included in these clubs

The results suggest a high number of convergence clubs, indicating a low level of convergence across the regions in terms of both consumption groups and income.

Novelty of the paper is threefold. Firstly, it takes into account not only the supply side of the regional disparities but also the demand side of them, while existing studies consider only the supply side of the regional disparities. Secondly, this is the most current study on Turkish regions covering the period 2005 to 2013.[1] Thirdly, This is the first study –to the authors' knowledge- that uses asymptotically perfect convergence and convergence clubs developed by Hobijn & Franses (2000) to test convergence across regions in Turkey.[2]

A brief review of the relevant literature will be presented in Section 2. This will be followed by the model and the data. Empirical results will be discussed in Section 4. Section 5 concludes the paper.

2. Literature Review

Initially a brief review of the literature on income convergence will be given, then we will present a few empirical study on consumption convergence.

2.1 Income Convergence

Studies on convergence test whether regional income differences decrease over time and regions converge to each other by using growth models. Neoclassical growth models are based on the work of Solow (1956). According to these models, economies with similar preferences and technological characteristics converge to the same level (Bernard & Durlauf, 1996). After the work of Baumol (1986), testing of the convergence hypothesis has become widespread (Durlauf & Johnson, 1995).

Islam (1995) analyzes the convergence of countries' incomes using a dynamic panel regression model and finds convergence across countries. Durlauf & Johnson (1995) do not prefer to employ the widely used linear models. They use multiple regimes instead of the linear models. Bernard & Durlauf (1995) employ two new convergence definitions and common trends and test them on 15 OECD countries. Having initially employed a technique proposed by Phillips & Ouliaris (1988) to find out the number of the linearly independent stochastic

[1] Abdioğlu & Uysal (2013a) and Abdioğlu & Uysal (2013b) cover the period from 2004 to 2008.

[2] Temel et al.(2005) studied convergence in productivity but not in income or expenditure and they covered the period 1975 to 1990.

trends, they use a second technique proposed by Johansen (1988, 1991) to obtain the rank in the cointegration matrix. They do not find convergence among countries.

Unlike these studies, Carlino & Mills (1993) test both the stochastic convergence and the β-convergence in the U. S. regions for nearly 60 years. They find stochastic convergence in regional per-capita incomes among 8 regions of the USA over the period from 1929 to 1990. They also find β-convergence across these regions.

Barro & Sala-i-Martin (1991) test the convergence among the 73 different regions of 7 Western European countries from the period 1950 to 1985. They find the convergence in the regions of Germany, Belgium, Denmark, France, Netherlands and United Kingdom. Barro & Sala-i-Martin (1992) investigate the convergence for both 47 prefectures of the Japan and 48 states of the USA. They find not only intra-regional convergence but also inter-regional convergence in these two countries. Bernard & Jones (1996) conduct the convergence in technology at both the aggregate and sectoral level for 14 OECD countries and find interesting results. Evans & Karras (1996) show that conventional approaches are invalid in different structure of data sets. They propose an alternative approach for different types of data sets. They also test this alternative approach for 48 states in the U.S. and a group of 54 countries and find strong conditional convergence. Hofer & Wörgötter (1997) assess the dispersion and growth of per capita income for 9 regions of Austria and 84 different districts using time series techniques and find very slow convergence. Barro & Sala-i-Martin (2004) investigate the disparities in the USA, in Japanese prefectures and in 8 different countries across Europe together over the period from 1880, 1930 and 1950, respectively and find absolute convergence for all of them. Cuaresma et al. (2011) study the robustness of the determinants of the growth in the regions in the EU by employing the Bayesian averaging model in the context of quantile regression and present that each quantile has different robust growth determinants.

Concerning the studies on Turkey, there are many studies that analyze the regional differences in per capita income for various regions and provinces. Both Filiztekin (1998) and Tansel & Güngör (1999) focus on the convergence for the period between 1975 and 1995. While Filiztekin (1998) analyzes not only convergence among the provinces of the Turkey employing fixed effect model but also its main sources by using the convergence pattern of the sector, Tansel & Güngör (1999) investigate both labor productivity level and labor productivity growth rates to test the convergence between less developed and richer Turkish provinces for this period. Both of them find convergence among the provinces. Moreover, Filiztekin (1998) finds that productivity levels and productivity growth differ among the sectors as well as the provinces of Turkey. Temel et al., (2005) analyze the convergence in labor productivity among the Turkish provinces using Markov chain model for the period from 1975 to 1990 and find a convergence club for agricultural provinces and a convergence club for a highly industrialized provinces. Erk et al., (2000) assess the convergence for 67 Turkish provinces for the year between 1979 and 1997 by employing beta and sigma convergence and find that provinces of Turkey do not convergence. Berber et al., (2000) also find that regions of Turkey do not converge after examining the Turkish regions using both cross-section and panel data covering the period between 1975 and 1997. Similarly, Karaca (2004) investigates the convergence in provinces of the Turkey over the period between 1975 and 2000 by using beta and sigma convergence and finds that Turkish provinces do no converge each other. Yamanoğlu (2008) finds weak convergence across the provinces of the Turkey using cross-section data for the period of 1990 and 2001. Moreover, he finds stronger convergence among these provinces for the sub-period of 1995 and 2001. Karaalp & Erdal (2012) assess the convergence across both 73 provinces and the provinces of the seven regions in Turkey using panel data during the period between 1993 and 2001 and find convergence across the provinces. Erlat (2012) studies the

convergence among both regions and provinces of the regions of Turkey for the period between 1975 and 2001 and finds convergence across some of the provinces and regions.

Unlike previous studies, there are only two studies on convergence in per capita income that include post-2001 period (2004-2008). Abdioğlu & Uysal (2013a) analyze the convergence for the 26 NUTS-2 regions for the period between 2004 and 2008 using panel unit roots and find that these 26 NUTS-2 regions do not converge in gross value added. Abdioğlu & Uysal (2013b) also examine the convergence in both sectoral and aggregate level for the 26 NUTS-2 regions using nonlinear panel regression during the period between 2004 and 2008 and find convergence in gross value added as well as agriculture, industry and service sectors.

2.2 Consumption Convergence

Almost all of the convergence studies mentioned above are concerned with convergence in per capita income. However, there is also expenditure dimension of the convergence. Mankiw et al., (1992) assess both the consistency of the Solow growth model with international variations in living standards and the standard of living converges and find that countries convergences. Similar arguments regarding the quality of life are expressed by Sen (1987, 1999), Khan(1991) and Dasgupta (1990, 1993). Moreover, Hobijn & Franses (2001) examine the convergence in the indicators of the standard of livings as an alternative to per capita income. They test the convergence for life expectancy at birth, daily protein supply, daily calorie supply, infant mortality rates as measures of standard of living by employing the cluster analysis, distributional dynamics and cross-section regressions and find that the convergence in per capita GDP does not necessitate that other measures converge. Angulo et al., (2001) also investigate the convergence in the elasticities of calorie intake as well as the elasticities of income for European Union countries and find very weak convergence across the products. Larson (2005) analyzes the stability of patterns of the regional food consumption for United States for 15 years and finds that the patterns of the food consumption in the northwest are not the same as in southwest. Novotny (2011) studies the convergence of the regions in the standards of living for 264 regions of EU27 for the period between 1992 and 2006. He mainly focuses on the convergence and divergence, mobility in the regions, switching, inter-national component's role and polarization of per capita GDP and per capita expenditure of household using different techniques and find ambigious results for the convergence of all of the regions of the Europe.

3. Model and Data

As mentioned in previous section, various techniques have been applied to test for the convergence among provinces and regions as well as countries so far. We prefer to employ the methodology developed by Hobijn & Franses (2000). This methodology is based on unit root test and cluster analysis.

Hobijn & Franses (2000) focus on three types of convergence: Asymptotically perfect convergence, asymptotically relative convergence and convergence of growth rates. The asymptotically perfect convergence, pioneered by Bernard & Durlauf (1995), suggests that the logarithms of per capita income levels of countries are similar, regardless of the current period income level. The asymptotically relative convergence, extension of Bernard & Durlauf (1995), suggests that the difference between countries' logarithms of per capita income levels converges to a certain fixed level, regardless of the current income situation of the countries. Finally the

convergence of growth rates suggests that countries converge to the same per capita productivity's growth rates, regardless of current period and past levels of per capita income.

The equations for expenditure and income in the analysis, based on Hobijn & Franses (2000), can be constructed as follows:

$$y_{(i,j)t} = s_{it} - s_{jt} \quad (1)$$

where s_i and s_j represent the shares of a group of expenditure in total expenditures in region i and region j, and $y_{(i,j)t}$ indicates the expenditure differences between regions. The equation for income can also be constructed in a similar way[3].

If $y_{(i,j)t}$ is stationary with a mean of zero, then i. and j. regions are asymptotically perfect convergent. If $y_{(i,j)t}$ is stationary at the level, then i. and j. regions are asymptotically relative convergent. Lastly, if the difference in $y_{(i,j)t}$ $\left(\Delta y_{(i,j)t,l}\right)$ is stationary with a mean of zero, then growth rates are convergent.

The panel unit root test can be applied to test the null hypothesis of convergence. For this purpose, the unit root equation for N regions in the analysis, also based on Hobijn & Franses (2000), can be written in intensive form as follows:

$$y_t = \alpha + \beta t + H\sum_{h=0}^{t-1} v_h + u_t$$

$$y_t = \left[y_{1t}, y_{2t} \ldots . y_{Nt}\right] \quad (2)$$

v_h denotes the first difference of at most N common stochastic trends in $y_{(i,j)t}$.

According to the above equations, asymptotically perfect convergence suggests asymptotically relative convergence and convergence of growth rates. This situation can be seen with the restrictions on the coefficient in the table.1 as follows:

Table.1 Restrictions of Coefficients for Different Types of Convergence

Type	*Restrictions of parameters*
Asymptotically perfect convergence	$\alpha_i=\alpha_j$, $H_{is}=H_{js}$ $\forall s=1,2,\ldots m$, $\beta_i = \beta_j$
Asymptotically relative convergence	$H_{is}=H_{js}$ $\forall s=1,2,\ldots m$, $\beta_i = \beta_j$
Convergence of growth rates	$\beta_i = \beta_j$

This table was constructed by taking into account Hobijn & Franses (2000).

In the table above, α_i and β_i are respectively the element of α and β vectors, while H_{is} is i. row and s. column elements of H matrix. Hobijn & Franses (2000) illustrate that the logarithm of the income ($y_{(i,j)t}$) per capita level's variance of the cross-section is infinity when, for i and j regions, $H_{is} \neq H_{js}$ for some s or $\beta_i \neq \beta_j$.

[3] $D_{(i,j)t} = s_{it} - s_{jt}$ where s_i and s_j represent gross value added in regions i and region j and $D_{(i,j)t}$ indicates the income differences between regions.

This suggests that variance goes to infinity if levels of $y_{(i,j)t}$ have different stochastic and deterministic trends and removes the possibility of a common stochastic trend. So that convergence of growth rates is a sufficient condition and not a necessary condition. However, asymptotically perfect convergence and asymptotically relative convergence suggests constraints on the stochastic trend. In both types of convergence, i and j regions converge if $y_{(i,j)t}$ levels are cointegrated each other with cointegrating vector [1 -1]. This is only possible if the constraint $H_{is} = H_{js}$ is valid. Thus, $y_{(i,j)t}$ has non-degenerate distribution. For this reason, we, in this study, focused on more realistic asymptotically perfect convergence and asymptotically relative convergence similar to Hobijn & Franses (2000).

The convergence analysis is switched to the clustering analysis after the convergence hypothesis is tested. Since the test statistics mentioned above are not tied to the order of the data, they constitute a basis for clustering analysis The clustering analysis developed by Hobijn & Franses (2000) consists of two stages since asymptotically perfect convergence suggests asymptotically relative convergence. In the first stage, regions are clustered on the basis of stationarity with zero mean. Then in the second stage, asymptotically perfect convergence clubs are clustered by the level of stationarity test results and asymptotically relative convergence clubs are obtained. The details of the clustering algorithm are given by Hobijn & Franses (2000).

This study covers the annual period 2005-2013 when analyzing regional consumption convergence and the period 2004-2011 when analyzing regional income convergence for 26 regions at NUTS-2 level.

For the analysis of convergence in expenditures, we use the share of each goods and services groups in total expenditures and regional price indexes (used as deflators). Gross value added at regional level is proxied for income for the analysis of convergence in income. All the data are collected from Turkish Statistical Institute (TSI, 2016).

4. Empirical Results

We apply the cluster algorithm to our regional expenditure and income data and identify the convergence clubs in this section.

4. 1. Convergence Clubs for Expenditures

The convergence clubs that we obtained by employing the asymptotically perfect convergence method for 26 regions are presented in the following tables. The tests are carried out for 12 groups of goods and services.

Table 1. Convergence Clubs for Food Expenditures

Club 1	Club 2	Club 3	Club 4	Club 5
TR71 (Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir)	TR72 (Kayseri, Sivas, Yozgat)	TR63 (Hatay, K. Maraş, Osmaniye)	TRA2 (Ağrı, Kars, Iğdır, Ardahan)	TR32 (Aydın, Denizli, Muğla)
TR82 (Kastamonu, Çankırı, Sinop)	TR81 (Zonguldak, Karabük, Bartın)	TR83 (Samsun, Tokat, Çorum, Amasya)	TRC2 (Şanlıurfa, Diyarbakır)	TR52 (Konya, Karaman)

Club 1	Club 2	Club 3	Club 4	Club 5
TR90 (Trabzon, Ordu, Giresun, Rize, Artvin,	TRB1 (Malatya, Elazığ, Bingöl, Tunceli)	TRC1 (Gaziantep, Adıyaman, Kilis)		
TRA1 (Erzurum, Erzincan, Bayburt)				
Club 6	**Club 7**	**Club 8**	**Club 9**	**Club 10**
TR21 (Tekirdağ, Edirne, Kırklareli)	TR22 (Balıkesir, Çanakkale)	TR31 (Izmir)	TRC3 (Mardin, Batman, Şırnak, Siirt)	TR42 (Kocaeli, Sakarya, Düzce, Bolu, Yalova)
TR41 (Bursa, Eskişehir, Bilecik)	TR33 (Manisa, Afyon, Kütahya, Uşak)	TR51 (Ankara)		
Club 11	**Club 12**	**Club 13**	**Club 14**	
TR61 (Antalya, Isparta, Burdur)	TR62 (Adana, Mersin)	TRB2 (Van, Muş, Bitlis, Hakkari)	TR10 (Istanbul)	

Table 2. Convergence Clubs for Alcoholic Expenditures

Club 1	Club 2	Club 3	Club 4	Club 5
TR41 (Bursa, Eskişehir, Bilecik)	TR52 (Konya, Karaman)	TR10 (Istanbul)	TR82 (Kastamonu, Çankırı, Sinop)	TR22 (Balıkesir, Çanakkale)
TR62 (Adana, Mersin)	TR83 (Samsun, Tokat, Çorum, Amasya)	TR61 (Antalya, Isparta, Burdur)	TR90 (Trabzon, Ordu, Giresun, Rize, Artvin,	TR71 (Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir)
TR81 (Zonguldak, Karabük, Bartın)	TRC1 (Gaziantep, Adıyaman, Kilis)	TRC3 (Mardin, Batman, Şırnak, Siirt)	TRB1 (Malatya, Elazığ, Bingöl, Tunceli)	
TRC2 (Şanlıurfa, Diyarbakır)				
Club 6	**Club 7**	**Club 8**	**Club 9**	**Club 10**
TR33 (Manisa, Afyon, Kütahya, Uşak)	TR21 (Tekirdağ, Edirne, Kırklareli)	TR42 (Kocaeli, Sakarya, Düzce, Bolu, Yalova)	TR63 (Hatay, K. Maraş, Osmaniye)	TR32 (Aydın, Denizli, Muğla)
TRA1 (Erzurum, Erzincan, Bayburt)	TR31 (Izmir)	TR72 (Kayseri, Sivas, Yozgat)		
Club 11	**Club 12**	**Club 13**		

TRA2 (Ağrı, Kars, Iğdır, Ardahan)	TR51 (Ankara)	TRB2 (Van, Muş, Bitlis, Hakkari)		

Table 3. Convergence Clubs for Clothing Expenditures

Club 1	**Club 2**	**Club 3**	**Club 4**	**Club 5**
TR22 (Balıkesir, Çanakkale)	TR52 (Konya, Karaman)	TR21 (Tekirdağ, Edirne, Kırklareli)	TRB2 (Van, Muş, Bitlis, Hakkari)	TRA1 (Erzurum, Erzincan, Bayburt)
TR32 (Aydın, Denizli, Muğla)	TR71 (Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir)	TR63 (Hatay, K. Maraş, Osmaniye)	TRC3 (Mardin, Batman, Şırnak, Siirt)	TRC2 (Şanlıurfa, Diyarbakır)
TR61 (Antalya, Isparta, Burdur)	TR90 (Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane)	TR81 (Zonguldak, Karabük, Bartın)		
TR72 (Kayseri, Sivas, Yozgat)				
Club 6	**Club 7**	**Club 8**	**Club 9**	**Club 10**
TR51 (Ankara)	TR42 (Kocaeli, Sakarya, Düzce, Bolu, Yalova)	TR41 (Bursa, Eskişehir, Bilecik)	TRB1 (Malatya, Elazığ, Bingöl, Tunceli)	TR10 (Istanbul)
TR82 (Kastamonu, Çankırı, Sinop)	TR83 (Samsun, Tokat, Çorum, Amasya)	TR62 (Adana, Mersin)	TRC1 (Gaziantep, Adıyaman, Kilis)	
Club 11	**Club 12**	**Club 13**		
TR31 (Izmir)	TRA2 (Ağrı, Kars, Iğdır, Ardahan)	TR33 (Manisa, Afyon, Kütahya, Uşak)		

Table 4. Convergence Clubs for Shelter Expenditures

Club 1	**Club 2**	**Club 3**	**Club 4**	**Club 5**
TR21 (Tekirdağ, Edirne, Kırklareli)	TR33 (Manisa, Afyon, Kütahya, Uşak)	TR52 (Konya, Karaman)	TRA1 (Erzurum, Erzincan, Bayburt)	TR90 (Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane)
TR32 (Aydın, Denizli, Muğla)	TR61 (Antalya, Isparta, Burdur)	TR62 (Adana, Mersin)	TRB1 (Malatya, Elazığ, Bingöl, Tunceli)	TRC2 (Şanlıurfa, Diyarbakır)

TR63 (Hatay, K. Maraş, Osmaniye)	TR71 (Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir)	TR81 (Zonguldak, Karabük, Bartın)		
TR82 (Kastamonu, Çankırı, Sinop)	TR83 (Samsun, Tokat, Çorum, Amasya)			
TRC1 (Gaziantep, Adıyaman, Kilis)				
Club 6	**Club 7**	**Club 8**	**Club 9**	**Club 10**
TR10 (Istanbul)	TR41 (Bursa, Eskişehir, Bilecik)	TR22 (Balıkesir, Çanakkale)	TRC3 (Mardin, Batman, Şırnak, Siirt)	TR31 (Izmir)
TR51 (Ankara)	TR72 (Kayseri, Sivas, Yozgat)	TR42 (Kocaeli, Sakarya, Düzce, Bolu, Yalova)		
Club 11	**Club 12**			
TRA2 (Ağrı, Kars, Iğdır, Ardahan)	TRB2 (Van, Muş, Bitlis, Hakkari)			

Table 5. Convergence Clubs for Furniture Expenditures

Club 1	**Club 2**	**Club 3**	**Club 4**	**Club 5**
TR71 (Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir)	TR41 (Bursa, Eskişehir, Bilecik)	TR21 (Tekirdağ, Edirne, Kırklareli)	TR22 (Balıkesir, Çanakkale)	TR61 (Antalya, Isparta, Burdur)
TR83 (Samsun, Tokat, Çorum, Amasya)	TR52 (Konya, Karaman)	TR33 (Manisa, Afyon, Kütahya, Uşak)	TR31 (Izmir)	TR63 (Hatay, K. Maraş, Osmaniye)
TRA1 (Erzurum, Erzincan, Bayburt)	TR82 (Kastamonu, Çankırı, Sinop)	TR72 (Kayseri, Sivas, Yozgat)	TR32 (Aydın, Denizli, Muğla)	TRC1 (Gaziantep, Adıyaman, Kilis)
TRB1 (Malatya, Elazığ, Bingöl, Tunceli)				
Club 6	**Club 7**	**Club 8**	**Club 9**	**Club 10**
TR42 (Kocaeli, Sakarya, Düzce, Bolu, Yalova)	TR81 (Zonguldak, Karabük, Bartın)	TR51 (Ankara)	TRC3 (Mardin, Batman, Şırnak, Siirt)	TR62 (Adana, Mersin)
TRC2 (Şanlıurfa, Diyarbakır)	TRB2 (Van, Muş, Bitlis, Hakkari)	TRA2 (Ağrı, Kars, Iğdır, Ardahan)		

Club 11	Club 12			
TR90 (Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane)	TR10 (Istanbul)			

Table 6. Convergence Clubs for Health Expenditures

Club 1	Club 2	Club 3	Club 4	Club 5
TR10 (Istanbul)	TR31 (Izmir)	TR61 (Antalya, Isparta, Burdur)	TR22 (Balıkesir, Çanakkale)	TR83 (Samsun, Tokat, Çorum, Amasya)
TR21 (Tekirdağ, Edirne, Kırklareli)	TR33 (Manisa, Afyon, Kütahya, Uşak)	TR71 (Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir)	TR51 (Ankara)	TRC1 (Gaziantep, Adıyaman, Kilis)
TR63 (Hatay, K. Maraş, Osmaniye)	TR42 (Kocaeli, Sakarya, Düzce, Bolu, Yalova)	TR81 (Zonguldak, Karabük, Bartın)	TRB1 (Malatya, Elazığ, Bingöl, Tunceli)	
TR90 (Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane)				
TRB2 (Van, Muş, Bitlis, Hakkari)				
Club 6	**Club 7**	**Club 8**	**Club 9**	**Club 10**
TR72 (Kayseri, Sivas, Yozgat)	TRA1 (Erzurum, Erzincan, Bayburt)	TR41 (Bursa, Eskişehir, Bilecik)	TR32 (Aydın, Denizli, Muğla)	TRA2 (Ağrı, Kars, Iğdır, Ardahan)
TR82 (Kastamonu, Çankırı, Sinop)	TRC2 (Şanlıurfa, Diyarbakır)	TRC3 (Mardin, Batman, Şırnak, Siirt)	TR52 (Konya, Karaman)	
Club 11				
TR62 (Adana, Mersin)				

Table 7. Convergence Clubs for Transportation Expenditures

Club 1	Club 2	Club 3	Club 4	Club 5
TR31 (Izmir)	TR10 (Istanbul)	TR90 (Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane)	TRA2 (Ağrı, Kars, Iğdır, Ardahan)	TR33 (Manisa, Afyon, Kütahya, Uşak)

TR41 (Bursa, Eskişehir, Bilecik)	TR42 (Kocaeli, Sakarya, Düzce, Bolu, Yalova)	TRB1 (Malatya, Elazığ, Bingöl, Tunceli)	TRB2 (Van, Muş, Bitlis, Hakkari)	TR72 (Kayseri, Sivas, Yozgat)
TR52 (Konya, Karaman)	TR71 (Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir)	TRC1 (Gaziantep, Adıyaman, Kilis)	TRC2 (Şanlıurfa, Diyarbakır)	TRA1 (Erzurum, Erzincan, Bayburt)
TR82 (Kastamonu, Çankırı, Sinop)				
Club 6	**Club 7**	**Club 8**	**Club 9**	**Club 10**
TR51 (Ankara)	TR21 (Tekirdağ, Edirne, Kırklareli)	TR81 (Zonguldak, Karabük, Bartın)	TRC3 (Mardin, Batman, Şırnak, Siirt)	TR22 (Balıkesir, Çanakkale)
TR62 (Adana, Mersin)	TR32 (Aydın, Denizli, Muğla)	TR83 (Samsun, Tokat, Çorum, Amasya)		
TR63 (Hatay, K. Maraş, Osmaniye)				
Club 11				
TR61 (Antalya, Isparta, Burdur)				

Table 8. Convergence Clubs for Communication Expenditures

Club 1	Club 2	Club 3	Club 4	Club 5
TR10 (Istanbul)	TR52 (Konya, Karaman)	TRA2 (Ağrı, Kars, Iğdır, Ardahan)	TR42 (Kocaeli, Sakarya, Düzce, Bolu, Yalova)	TR22 (Balıkesir, Çanakkale)
TR31 (Izmir)	TR62 (Adana, Mersin)	TRC1 (Gaziantep, Adıyaman, Kilis)	TR51 (Ankara)	TR32 (Aydın, Denizli, Muğla)
TR33 (Manisa, Afyon, Kütahya, Uşak)	TR72 (Kayseri, Sivas, Yozgat)	TRC2 (Şanlıurfa, Diyarbakır)	TRA1 (Erzurum, Erzincan, Bayburt)	TR41 (Bursa, Eskişehir, Bilecik)
TRB1 (Malatya, Elazığ, Bingöl, Tunceli)				
Club 6	**Club 7**	**Club 8**	**Club 9**	**Club 10**

TR82 (Kastamonu, Çankırı, Sinop)	TR71 (Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir)	TR81 (Zonguldak, Karabük, Bartın)	TR61 (Antalya, Isparta, Burdur)	TRC3 (Mardin, Batman, Şırnak, Siirt)
TR90 (Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane)	TR83 (Samsun, Tokat, Çorum, Amasya)	TRB2 (Van, Muş, Bitlis, Hakkari)		
Club 11	**Club 12**			
TR21 (Tekirdağ, Edirne, Kırklareli)	TR63 (Hatay, K. Maraş, Osmaniye)			

Table 9. Convergence Clubs for Recreation Expenditures

Club 1	**Club 2**	**Club 3**	**Club 4**	**Club 5**
TR42 (Kocaeli, Sakarya, Düzce, Bolu, Yalova)	TR63 (Hatay, K. Maraş, Osmaniye)	TRA2 (Ağrı, Kars, Iğdır, Ardahan)	TR22 (Balıkesir, Çanakkale)	TR31 (Izmir)
TR81 (Zonguldak, Karabük, Bartın)	TRA1 (Erzurum, Erzincan, Bayburt)	TRC2 (Şanlıurfa, Diyarbakır)	TR33 (Manisa, Afyon, Kütahya, Uşak)	TR51 (Ankara)
TR83 (Samsun, Tokat, Çorum, Amasya)	TRB1 (Malatya, Elazığ, Bingöl, Tunceli)	TRC3 (Mardin, Batman, Şırnak, Siirt)	TR82 (Kastamonu, Çankırı, Sinop)	TR61 (Antalya, Isparta, Burdur)
TRC1 (Gaziantep, Adıyaman, Kilis)				
Club 6	**Club 7**	**Club 8**	**Club 9**	**Club 10**
TR10 (Istanbul)	TR32 (Aydın, Denizli, Muğla)	TR71 (Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir)	TR21 (Tekirdağ, Edirne, Kırklareli)	TR90 (Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane)
TR62 (Adana, Mersin)	TR41 (Bursa, Eskişehir, Bilecik)	TRB2 (Van, Muş, Bitlis, Hakkari)	TR52 (Konya, Karaman)	
Club 11				
TR72 (Kayseri, Sivas, Yozgat)				

Table 10. Convergence Clubs for Education Expenditures

Club 1	**Club 2**	**Club 3**	**Club 4**	**Club 5**

TR22 (Balıkesir, Çanakkale)	TR71 (Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir)	TR33 (Manisa, Afyon, Kütahya, Uşak)	TR63 (Hatay, K. Maraş, Osmaniye)	TR83 (Samsun, Tokat, Çorum, Amasya)
TR32 (Aydın, Denizli, Muğla)	TR72 (Kayseri, Sivas, Yozgat)	TR61 (Antalya, Isparta, Burdur)	TRA1 (Erzurum, Erzincan, Bayburt)	TR90 (Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane)
TR81 (Zonguldak, Karabük, Bartın)	TR82 (Kastamonu, Çankırı, Sinop)	TR62 (Adana, Mersin)	TRB2 (Van, Muş, Bitlis, Hakkari)	
TRB1 (Malatya, Elazığ, Bingöl, Tunceli)	TRC1 (Gaziantep, Adıyaman, Kilis)			
Club 6	**Club 7**	**Club 8**	**Club 9**	**Club 10**
TRA2 (Ağrı, Kars, Iğdır, Ardahan)	TR10 (Istanbul)	TR31 (Izmir)	TR41 (Bursa, Eskişehir, Bilecik)	TR42 (Kocaeli, Sakarya, Düzce, Bolu, Yalova)
TRC3 (Mardin, Batman, Şırnak, Siirt)	TR21 (Tekirdağ, Edirne, Kırklareli)	TR51 (Ankara)		
Club 11	**Club 12**			
TRC2 (Şanlıurfa, Diyarbakır)	TR52 (Konya, Karaman)			

Table 11. Convergence Clubs for Restaurant Expenditures

Club 1	Club 2	Club 3	Club 4	Club 5
TR21 (Tekirdağ, Edirne, Kırklareli)	TR22 (Balıkesir, Çanakkale)	TR32 (Aydın, Denizli, Muğla)	TR82 (Kastamonu, Çankırı, Sinop)	TR52 (Konya, Karaman)
TR61 (Antalya, Isparta, Burdur)	TR33 (Manisa, Afyon, Kütahya, Uşak)	TR71 (Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir)	TR83 (Samsun, Tokat, Çorum, Amasya)	TR62 (Adana, Mersin)
TR63 (Hatay, K. Maraş, Osmaniye)	TR81 (Zonguldak, Karabük, Bartın)	TR72 (Kayseri, Sivas, Yozgat)		
TR90 (Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane)				
TRB1 (Malatya, Elazığ, Bingöl, Tunceli)				

Club 6	Club 7	Club 8	Club 9	Club 10
TRA1 (Erzurum, Erzincan, Bayburt)	TR42 (Kocaeli, Sakarya, Düzce, Bolu, Yalova)	TRB2 (Van, Muş, Bitlis, Hakkari)	TR31 (Izmir)	TRC2 (Şanlıurfa, Diyarbakır)
TRA2 (Ağrı, Kars, Iğdır, Ardahan)	TRC3 (Mardin, Batman, Şırnak, Siirt)	TRC1 (Gaziantep, Adıyaman, Kilis)	TR41 (Bursa, Eskişehir, Bilecik)	
Club 11	**Club 12**			
TR51 (Ankara)	TR10 (Istanbul)			

Table 12. Convergence Clubs for Other Expenditures

Club 1	Club 2	Club 3	Club 4	Club 5
TR33 (Manisa, Afyon, Kütahya, Uşak)	TR62 (Adana, Mersin)	TR42 (Kocaeli, Sakarya, Düzce, Bolu, Yalova)	TR22 (Balıkesir, Çanakkale)	TR10 (Istanbul)
TR51 (Ankara)	TR63 (Hatay, K. Maraş, Osmaniye)	TR61 (Antalya, Isparta, Burdur)	TRA1 (Erzurum, Erzincan, Bayburt)	TR52 (Konya, Karaman)
TR81 (Zonguldak, Karabük, Bartın)	TRA2 (Ağrı, Kars, Iğdır, Ardahan)	TRB2 (Van, Muş, Bitlis, Hakkari)	TRC3 (Mardin, Batman, Şırnak, Siirt)	TR82 (Kastamonu, Çankırı, Sinop)
TRC2 (Şanlıurfa, Diyarbakır)				
Club 6	**Club 7**	**Club 8**	**Club 9**	**Club 10**
TR90 (Trabzon, Ordu, Giresun, Rize, Artvin,	TR32 (Aydın, Denizli, Muğla)	TR31 (Izmir)	TR41 (Bursa, Eskişehir, Bilecik)	TR21 (Tekirdağ, Edirne, Kırklareli)
TRC1 (Gaziantep, Adıyaman, Kilis)	TR72 (Kayseri, Sivas, Yozgat)	TR71 (Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir)	TRB1 (Malatya, Elazığ, Bingöl, Tunceli)	TR83 (Samsun, Tokat, Çorum, Amasya)

The results of asymptotically perfect convergence analyses show that the number of clubs in terms of expenditures change from 10 or 14 clubs for these 26 regions in the NUTS-2 level. Food expenditures have the highest number of convergence clubs with 14 clubs among all groups. Alcohol and clothing expenditures have the second highest number of convergence clubs with 13 clubs. The next highest number of convergence clubs with 12 clubs belongs to shelter, furniture, communication, education and restaurant expenditures. We found 11 convergence clubs for health, transportation and recreation expenditures. Finally, other expenditures have the lowest number of convergence clubs with 10 clubs.

Istanbul, Ankara and Izmir, respectively, are three biggest cities as well as 3 different NUTS-2 regions by themselves in Turkey. Among these cities, Istanbul and Ankara are in the same club in shelter expenditures according to the empirical results. Ankara and Izmir are in the same club in food, education and recreation expenditures. Finally, Istanbul and Izmir are in the same club in communication expenditures according to the results. Thus, the most populated cities seem to converge each other for these groups of expenditures.

There seems to be no neighborhood effects on convergence of consumption behaviors as the empirical results provide no significant evidence for locational proximity. The existing clubs seem to be not geographically but randomly constituted.

4. 1. Convergence Clubs for Income

We obtain the following convergence clubs for income by employing the asymptotically perfect convergence method for 26 regions:

Table 13. Convergence Clubs for Income

Club 1	**Club 2**	**Club 3**	**Club 4**	**Club 5**
TR52 (Konya Karaman)	TR72 (Kayseri, Sivas, Yozgat)	TR32 (Aydın, Denizli, Muğla)	TR41 (Bursa, Eskişehir, Bilecik)	TR63 (Hatay, K. Maraş, Osmaniye)
TR82 (Kastamonu Çankırı Sinop)	TR83 (Samsun, Tokat, Çorum, Amasya)	TR81 (Zonguldak, Karabük, Bartın)	TR42 (Kocaeli, Sakarya, Düzce, Bolu, Yalova)	TRB1 (Malatya, Elazığ, Bingöl, Tunceli)
TR90 (Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane)				
Club 6	**Club 7**	**Club 8**	**Club 9**	**Club 10**
TRC3 (Mardin, Batman, Şırnak, Siirt)	TRA1 (Erzurum, Erzincan, Bayburt)	TR71 (Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir)	TRA2 (Ağrı, Kars, Iğdır, Ardahan)	TR62 (Adana, Mersin)
Club 11	**Club 12**	**Club 13**	**Club 14**	**Club 15**
TR61 (Antalya, Isparta, Burdur)	TRB2 (Van, Muş, Bitlis, Hakkari)	TR51 (Ankara)	TRC1 (Gaziantep, Adıyaman, Kilis)	TR33 (Manisa, Afyon, Kütahya, Uşak)
Club 16	**Club 17**	**Club 18**	**Club 19**	**Club 20**
TRC2 (Şanlıurfa, Diyarbakır)	TR31 (Izmir)	TR22 (Balıkesir, Çanakkale)	TR21 (Tekirdağ, Edirne, Kırklareli)	TR10 (Istanbul)

The results of the asymptotically perfect convergence analyses illustrate that number of the clubs in terms of income reaches up to 20 clubs. Even big cities constitute single groups. Thus one can say that regional income disparities seem to be not decreasing over the period in the country.

5. Conclusion

We analyze the convergence from demand and supply perspectives by using the expenditures and the income, respectively. The data are collected for 12 groups of goods and services groups as well as income across 26 NUTS-2 regions of Turkey and asymptotically perfect convergence method is used.

Not only asymptotically perfect convergence results for expenditures but also the results for income present high number of convergence clubs, indicating a low level of convergence in Turkish regions. As mentioned in Koç(2008), each region has its own social, cultural, economic and geographical characteristics in the country with a wide geography. The largest clubs contain 4 or 5 regions, a result implying that consumption behaviors seem to converge within a small number of regions but not across the country. There are 20 clubs for 26 regions in terms of income, providing no significant evidence for convergence across the country. These results are in line with most of the literature that actually has mixed results on regional convergence in Turkey.

Differences in consumption behaviors of the households may be because of their income differences, if not due to their preferences. Thus, having low level of convergence in expenditures can be considered as a further support for the evidence that we obtained in terms of income convergence. Regional disparities across the regions are still a major problem for economic development of the country. The policymakers need to take into account these disparities when designing public policies.

This paper contributes to the existing convergence literature by analyzing the differences in consumption behaviors in addition to income differences for a more comprehensive understanding of the issue. Employing the asymptotically perfect convergence clubs method is also a novelty of the study. For further research, the span of data may be extended for more robust estimations. In addition, the price and income elasticities of each groups of expenditures (as a proxy for demand) can be estimated in order to understand the consumption habits of the households in each region so that one can have a more comprehensive idea about the sources of regional differences.

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