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SPECIALIZATION, DIVERSITY, AND REGION SIZE

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Abstract

This paper investigates the changes in employment structures of Turkish NUTS 3 regions, and examines the links between sectoral composition and region size. Emphasis is given to measuring specialization and diversity independently and with different measures, and also at different levels of sectoral aggregation. The results of the analyses undertaken indicate a tendency towards more specialization. The study has found a negative relationship between size and specialization, and a positive relationship between size and diversity.

Keywords: Specialization, Diversity, Region Size, Measures, Employment Structure

UZMANLAŞMA, ÇEŞİTLİLİK VE BÖLGE BÜYÜKLÜĞÜ

Özet

Bu makale Türkiye Düzey 3 bölgelerinin istihdam yapısındaki değişimleri ve sektörel yapı ve bölge büyüklüğü arasındaki ilişkileri incelemektedir. Uzmanlaşma ve çeşitlilik seviyeleri ayrı ayrı, farklı ölçüler kullanılarak ve farklı sektörel sınıflama düzeylerine göre ölçülmeye çalışılmıştır. Analiz sonuçları daha fazla uzmanlaşma yönünde bir eğilimi işaret etmektedir. Çalışma, büyüklük ve uzmanlaşma arasında negatif; büyüklük ve çeşitlilik arasında ise pozitif bir ilişkinin olduğunu bulgulamaktadır.

Anahtar kelimeler: Uzmanlaşma, Çeşitlilik, Bölge Büyüklüğü, Ölçüler, İstihdam Yapısı

1. INTRODUCTION

The specialization and diversity of employment has attracted interest of researchers considerably, over a long period of time. Previous empirical research on specialization and diversity has focused on a range of themes, including: changing patterns of employment structure and industrial composition (O'Donoghue & Townshend, 2005; Bishop & Gripaios, 2007); the link between growth and specialization and/or diversity (Glaeser, Kallal, Scheinkman, & Shleifer, 1992; Henderson, Kuncoro, & Turner, 1995; O'Donoghue, 1999; Combes, 2000; Beer & Clower, 2009); region size and industrial composition (Marshall, 1975; Henderson, 1997; Duranton & Puga, 2000; Dewhurst & McCann, 2007); diversity and economic stability (Malizia & Ke, 1993; Dissart, 2003); and specialization, diversity and innovation (Duranton & Puga, 2001; van der Panne & van Beers, 2006).

A review of theoretical approaches concerned with specialization and diversity has been provided by Duranton and Puga (2000) and Abdel-Rahman and Anas (2004). Moreover, much of the recent literature has emphasized the problems associated with measuring specialization and diversity (Dewhurst & McCann, 2007), and provided a comprehensive review of various measures (Siegel, Johnson, & Alwang, 1995; Wagner, 2000) and their comparisons (Dewhurst & McCann, 2002; Mack, Grubesic, & Kessler, 2007).

For Turkey, the majority of regional studies have focused on specialization rather than diversity and mainly on specialization in manufacturing industry. Conducted in various contexts, these studies have measured specialization at different spatial units, such as the geographical regions (Akgüngör, 2003; Akgüngör, Kumral, & Lenger, 2003), the industrial regions (Akgüngör, 2006), the NUTS2 regions (Falcıoğlu, 2008; Falcıoğlu & Akgüngör, 2008; Kaya, 2006; Akgüngör & Falcıoğlu, 2005) and the NUTS3 regions (Kıymalıoğlu & Ayoğlu, 2006).

Among these studies Falcıoğlu (2008) considers the determinants of productivity and finds that regional specialization level is not a significant determinant in productivity of Turkish regions. In the research on the scope and sources of agglomeration economies in Turkish Manufacturing Industry, Kıymalıoğlu and Ayoğlu (2006) find that diversity does not support agglomeration, and Jacobian and Porter externalities have no effect on the individual sectors. They also find that manufacturing sectors at two-digit level are subject to localization economies and Marshallian externalities are the causes of agglomeration, and specialization effects are strong especially in the sectors of textile, wearing apparel and leather industries and basic metal industries.

Detailed studies of the spatial pattern of specialization and diversity across Turkey are relatively limited. For 26 NUTS2 regions and by using the Gini coefficient, Akgüngör and Falcıoğlu (2005) measure the levels of regional specialization at the two-digit level over the period 1992-2001 and more recently, by measuring the regional specialization levels at the 4-digit manufacturing sectors Falcıoğlu and Akgüngör (2008) investigate the changes in the pattern of regional specialization between 1980 and 2000. These two studies highlight a tendency of increase in the average values of the Gini coefficient over time.

This study seeks to investigate the regional sectoral compositions and the changes in patterns of employment structure of Turkish regions from 1990 to 2000, by focusing not merely on manufacturing sectors but all non-agricultural economic activities. Furthermore, the study endeavours to examine the links between sectoral composition and the region size. The paper aims to complement the findings of studies on regional specialization in Turkey, and to make a contribution to empirical studies on specialization and diversity by a Turkish context.

More specifically the paper has three objectives: firstly, to identify the economic activities in which each region is specialized, and to examine the changes in sectoral specializations in regions; secondly, to specify the degree of regional specialization and the level of diversity in each region, and to examine the direction of change whether regions become more specialized or more diversified; and thirdly, to investigate the relationship between the size of regions and their specialization and diversity levels. In addition, an effort is made to illustrate the differences when specialization and diversity are quantified by different measures and at different levels of sectoral disaggregation.

The paper is organized to reflect these aims. The following section reviews the recent literature on the measures of specialization and diversity. This is followed by an overview of the data and the techniques that have been used. The next section outlines the national profile briefly. The paper then presents the regional empirical analysis and the results. Finally, a summary of the key findings is discussed in the conclusion section.

2. MEASURING REGIONAL SPECIALIZATION AND DIVERSITY

Specialization is simply defined as the share of industry *i*'s employment relative to total employment in a specific region *j*. The level of specialization in region *j* with respect to industry *i* is given by:

$$S_{ij} = \frac{x_{ij}}{\sum_{i=1}^{I} x_{ij}} \qquad [1.1]$$

While some industries comprise a larger share of overall employment than others, the location quotient (LQ) is more commonly used in measuring sectoral specialization as an index of relative specialization:

$$LQ_{ij} = \frac{S_{ij}}{S_i} \qquad [1.2]$$

where S_i is the share of industry *i* in national employment.

However, the aim of identifying the levels of regional specialization and diversity necessitates a measure which takes account of aggregate specialization/diversity across industrial sectors. A number of measures of aggregate regional specialization have been adopted in the empirical literature, such as the Gini coefficient (Dewhurst & McCann, 2007; Marshall, 1975; Falcıoğlu, 2008; Falcıoğlu & Akgüngör, 2008; Akgüngör & Falcıoğlu, 2005), the coefficient of specialization (Blair, 1995; Dewhurst & McCann, 2007) and the Hirschman-Herfindahl index. In some studies, in which diversity is regarded as the flipside of specialization, measures of specialization have been used as an inverse measure of diversity. For example, Henderson (1997) uses Hirschman-Herfindahl index, and O'Donoghue and Townshend (2005) and O'Donoghue (1999) the Gini-coefficient to measure the level of regional diversity. As a measure of

regional diversity van der Panne and van Beers (2006) employ the complement of the Gini-coefficient which is ($1\text{-}GINI_j$), and Bishop and Gripaios (2007) utilize entropy measure of diversity while Duranton and Puga (2000) suggest the use of the inverse of Hirschman-Herfindahl and dissimilarity index.

All these aggregate measures help to evaluate the industrial composition or economic structure of a region, and allow for the comparisons and rankings of regions in terms of the degree of specialization and/or the extent of diversity. However, it is necessary to distinguish between absolute and relative measures, the different definitions that these measures are related to and also the opposing considerations of specialization and diversity.

Specialization, as defined by Parr, is "the extent to which the economic structure of a city or region differs from that of a benchmark economy… the degree to which a region engages in economic activity as compared with the nation as a whole", and maximum specialization is attained when "local employment be concentrated within the smallest national employment category" (1965, pp. 22,23). Additionally, economic structure of a region corresponding exactly to national structure is a situation of minimum specialization. In accordance with these definitions, the examination of literature reveals that there is an agreement on the use of relative measures, which involve comparisons of regional data with national figures, to compute the degree of regional specialization (Dewhurst & McCann, 2002).

In general, regional diversity is defined as "the extent to which the economic activity of a region is distributed among a number of categories" (Parr, 1965, p. 22). However, there have been two different definitions of maximum diversity in the literature: maximum diversity as equal shares and maximum diversity as national profile. When maximum diversity is referred to as equal shares, the situation is that all categories contain equal amounts of economic activity in a region. Correspondingly, it can be said that the more evenly a region's economic activity is distributed among its sectors, the greater its diversity. In relation to this definition, the utilization of absolute measures, which are based merely on regional data, has been favoured to compute regional diversity. On the other hand, referring to maximum diversity as national profile implies that maximum diversity has been achieved when the level of regional diversity is equal to the extent of national diversity, or in other words, regional economic structure corresponding exactly to national structure. As anticipated, such a definition entails the use of relative measures.

Moreover, with reference to specialization and diversity, two different opinions have been put forward in the literature: specialization and diversity as a single continuum and as two continua of economic structure. In terms of single continuum of economic structure, some authors consider that the concepts of specialization and diversity are wholly complementary and flipside of each other. For example, Marshall (1975) claims that: "It seems both simpler and more realistic to regard specialization and diversification as

the two ends of a single dimension... a city is said to be diversified if it resembles the weighted national profile, and specialized if it does not" (p.38). When diversity is regarded as the flipside of specialization, the measures (such as the Gini-coefficient, Hirschman-Herfindahl index) used specify diversity with low values and specialization with high values (for instance in Henderson, 1997; O'Donoghue, 1999; O'Donoghue and Townshend, 2005).

On the contrary, Parr (1965) argues that specialization and diversity cannot be two ends of a single dimension. Considering maximum diversity as equal shares, he points out that maximum diversity and minimum specialization are not identical situations, and "...although maximum specialization corresponds to minimum diversification, the converse does not always hold true" (p.23). Thus, specialization and diversity are two continua of economic structure. This view has been supported also by others. As noted by Duranton and Puga (2000), a region can be both diversified and specialized. Diversity does not mean the absence of specialization but the presence of multiple specializations (Malizia & Ke, 1993; Dissart, 2003; Nakamura & Paul, 2009).

Besides different definitions and different considerations of specialization and diversity, it is also necessary to recognize that different measures display quite different values and especially different rankings of regions (Dewhurst & McCann, 2002). For example, the Gini-coefficient and the dissimilarity index are both relative measures; however the former measures specialization in terms of ratios whereas the later measures in terms of absolute differences. Therefore, the result would be inevitably unlike. Moreover, as emphasized by Dewhurst and McCann (2007) the results of measuring specialization and diversity are very sensitive to the level of sectoral aggregation used and the spatial unit of analysis chosen, as well.

Taking all above considerations into account, this study utilizes two measures to compute the degree of regional specialization and two measures to specify the extent of regional diversity. The measures were selected due to their simplicity of usage. The first measure used to calculate regional specialization, and also to explore the economic activity in which each region is specialized, is the relative measure that employed by Duranton and Puga (2000). This relative specialization index, which can be expressed as:

$$RSI_j = Max_i \left(\frac{S_{ij}}{S_i} \right) \qquad [1.3]$$

specifies the level of specialization in region *j* by the maximum LQ value.

The dissimilarity index is the second measure that used as an alternative to measuring regional specialization in terms of ratios. This index compares the regional composition with national composition and shows the deviation of regional structure by summing the absolute differences between the regional and national shares of industries[1]:

$$DIS_j = \sum_{i=1}^{I} |S_{ij} - S_i| \qquad [1.4]$$

It takes values between zero and two; a value of zero indicates that region *j* has an industrial composition identical to nation or in other words, maximum diversity and a maximum value of two indicates maximum specialization.

The inverse of dissimilarity and Hirschman-Herfindahl indices, as used by Duranton and Puga (2000), are utilized to measure regional diversity. The relative diversity index (*RDI*) in the form of inverse of *DIS* is positively related to regional diversity. This index value increases, the more regional industrial structure reflects the national structure. The absolute diversity index (*ADI*) in the form of inverse Hirschman-Herfindahl index, which can be expressed as:

$$ADI_j = {1}/{\sum_{i=1}^{I} (S_{ij})^2} \qquad [1.5]$$

is also positively related to diversity. The index takes a value of *I* if all categories contain equal amounts of economic activity in a region, and takes a value of 1 if the region is fully concentrated in a sector. The index value increases as economic activities become more diverse.

3. DATA AND TECHNIQUES

The unit of analysis here in this study is the NUTS 3 regions, or in other words the provinces. The provincial employment data were collected from the Turkish Statistical Institute and derived from the Census of Population[2] (CP) for 1990 and 2000. In accordance with the availability of data, the numbers of provinces analyzed are 81 for 2000, and 73 for 1990. With the intention of obtaining a comprehensive depiction of a region's specialization and diversity, the study focuses not on merely the manufacturing sectors but all non-agricultural economic activities. So, for each region the CP data, classified according to ISIC Rev 2, were analyzed across 30 two-digit non-agricultural sectors and across 9 two-digit manufacturing sectors using the measures of the *RSI, DIS, ADI* and *RDI* described in the previous section.

The Spearman rank correlation test as a simple descriptive statistics was utilized to make a comparison between measures, and to analyze the relationship between size and specialization and diversity. Within the context of the paper, the analyses were conducted by arranging the regions with respect to size distribution of their urban population as large (over 1 million), medium (0.5 to 1 million) and small (under 0.5 million). This arrangement allowed further examination of industrial compositions by revealing the characteristics related to size.

To analyse the sensitivity with respect to the level of sectoral aggregation, an additional employment data were derived from the source of the General

Census of Industry and Business Establishments (GSIBE). However, the most recent disaggregated provincial data were available only for 1992. Classified according to NACE Rev 1.1, the GSIBE data for 1992 comprise 76 provinces, and the data related to manufacturing industry cover only the small-sized establishments having an annual average of 1-9 employees. In order to reveal differences concerning different disaggregation levels, the data were analyzed across 12 one-digit, 52 two-digit, 130 three-digit, and 231 four-digit non-agricultural sectors, for each region.

4. NATIONAL PROFILE

4.1. The Size Distribution of Regions

The term region, here in this study refers to "province" which corresponds to an administrative unit and to NUTS 3 region, as well. A province comprises districts, sub-districts and villages. It, therefore, includes both urban and rural population. The number of provinces in the country, which was 73 in 1990, has been 81 since 2000.

The analysis of the population data across size categories shows that the large provinces (over 1 million) have the largest share of both total and urban population. In 2000, 39 small provinces account for only 16 % of total population. As seen in Table 1 the share of urban population in each size category in 2000 is little different than in 1990. However, there is a substantial increase in the share of total population in large provinces. It is also clearly seen that the shares of medium (0.5 to 1 million) and small (under 0.5 million) size provinces are declining.

Table 1. Changes in the distribution of population

	1990			**2000**		
	# of provinces	% of total pop.	% of total urban pop.	# of provinces	% of total pop.	% of total urban pop.
Large provinces	14	49	61	18	58	65
Medium provinces	23	31	24	24	26	21
Small provinces	36	20	15	39	16	13

4.2. National Sectoral Composition and the Size Distribution of Employment

Table 2 presents the national sectoral composition and the changes in the structure of employment over time. According to the CP data for 1990 and

2000, urban employment accounts for 81% of total employment in Turkey. In the composition of employment Community, Social and Personal Services (CSPS) has the largest share. Manufacturing is the second largest sector and the third one is Wholesale and Retail Trade, Hotels and Restaurants (WRTHR). Financing, Insurance, Real Estate and Business Services (FIREBS), WRTHR and CSPS have a growing share while the shares of rest of the sectors are declining. The major growth in the number of employment takes place in FIREBS, and Mining and Quarrying is the only sector having a decline in its employment.

Table 2. Changes in the national sectoral composition

	Total Employment			**Urban Employment**		
	Shares		% change in	Shares		% change in
	1990	2000		1990	2000	
Mining and Quarrying	1,2	0,7	-26,6	0,6	0,5	-8,0
Manufacturing	26,0	24,5	17,8	25,8	24,8	20,6
Electricity, Gas and Water	0,8	0,7	22,2	0,7	0,7	22,9
Construction	11,1	8,9	1,0	9,9	7,9	-0,4
WRTR	17,3	18,8	35,5	18,4	19,4	32,0
Transport, Storage, Com.	7,3	6,4	10,0	6,9	6,3	13,8
FIREBS	5,1	6,0	49,2	5,7	6,6	44,8
CSPS	31,3	34,0	35,9	31,8	33,9	33,7
Total	100,0	100,0	25,2	100,0	100,0	25,6

Similarly to the population distribution, sectoral employment distribution through size categories in Table 3 highlights that large provinces comprise the majority of the people employed in each sector. The only sector that the distribution of employment is not proportional to size is the natural resource based Mining and Quarrying sector.

Table 3. Size distribution of sectoral employment

	1990	**2000**

	Large	Medium	Small	Large	Medium	Small
Mining and Quarrying	23,6	63,6	12,8	32,8	30,8	36,4
Manufacturing	65,4	21,8	12,8	74,8	15,3	9,9
Electricity, Gas and Water	52,3	30,6	17,1	62,7	22,1	15,2
Construction	55,5	27,3	17,2	61,9	22,7	15,4
Wholesale and Retail Trade	65,8	21,8	12,4	71,7	17,6	10,7
Hotels, Restr.	63,0	23,3	13,7	69,7	19,6	10,7
Transport, Storage, Com.	58,2	25,5	16,3	68,1	18,9	13,0
Finance, Insurance	68,1	19,2	12,7	77,1	13,8	9,1
Real Estate, Business Serv.	78,9	14,2	6,9	79,9	12,5	7,6
Community Soc. Per. Serv.	52,7	26,0	21,3	59,6	22,1	18,3

5. REGIONAL ANALYSES

5.1. Regional Sectoral Specializations

As an initial step for an analysis of regional sectoral compositions, the *RSI* values were computed for each region, for the years 1990 and 2000. That index facilitated identifying the sectors in which each region is specialized and investigating the changes in sectoral specializations. The outcomes are listed in Table A1 and for manufacturing in Table A2 in the Appendix.

The first feature to note with respect to *RSI* values is that the most specialized regions are the ones which specialized in sectors dependent on natural resources such as crude petroleum and natural gas production (Kırıkkale, Adıyaman, Batman), coal mining (Zonguldak, Bartın, Kütahya) and metal ore mining (Karabük, Elazığ, Artvin). The regions which have the highest *RSI* value in manufacturing are those specialized in the sector of basic metal industries (Karabük, Zonguldak, Hatay).

The comparison of sectoral compositions in 1990 and 2000 reveals that 40 out of 73 regions have remained unchanged in their specialization patterns over the 10 years. The *RSI* values of 21 out of 40 regions and 14 out of 33 regions, which have a change in their specialization patterns, display an increase, while others a decrease. As can be seen in Table A1, the majority of large size regions have a change in their profiles whereas medium size regions remain stable in their sectoral composition, including their sectors of manufacturing (Table A2). Such an outcome appears to support the

suggestion by Henderson (1997) that medium size regions tend to persist over time in their specialization patterns.

The medium size regions showing persistence in their sectors of specialization are: Mersin (wholesale trade, and non-metallic mineral products), Antalya (restaurants and hotels, and wood and wood products), Diyarbakır (crude petroleum production, and tobacco products), Kayseri (metal ore mining), Kocaeli (chemicals and chemical, petroleum, coal, rubber and plastic products), Manisa (coal mining, and non-metallic mineral products), Samsun (food products and beverages), Hatay (basic metal industries), Balıkesir (other mining, and food products and beverages) and Eskişehir (other mining, and non-metallic mineral products).

Looking at Tables A1 and A2, it can be noticed that Antalya, Aydın and Muğla are tourism centers; Antep, Denizli and Uşak are centers of textiles; Samsun, Rize, Muş and Giresun of food production, and Çorum, Çanakkale and Bilecik of non-metallic mineral products. One can also see that some regions locating in Northeast, Centraleast and Southeast Anatolia have the maximum LQ values of specialization in the sector of public administration and defence.

5.2. Levels of Regional Specialization and Diversity

As a next step for analyzing the regional industrial compositions, the levels of regional specialization and diversity for each region were specified by using the measures of *RSI (*equation 1.3*), DSI (*equation 1.4*), ADI* (equation 1.5) and *RDI*. Unsurprisingly, the results of analysis exhibited considerable variations in the rankings of regions. These variations can easily be seen from Table 4 and 5 which list the top 10 most specialized regions in terms of *RSI* and *DIS* indices, and most diversified regions in terms of *ADI* and *RDI* indices.

Examining the tables, one can notice that the majority of the regions existed in the top 10 lists for 1990 are included in the lists for the year 2000 (except the diversified regions in manufacturing measured by the *ADI*). Accordingly, when the rankings for 1990 and 2000, for each measure, were correlated, a relatively strong relationship was found (rho_{RSI}=0.68, rho_{DI}=0.89, rho_{ADI}=0.89, and rho_{RDI}=0.90). For manufacturing, the rankings of 73 regions for 1990 and 2000 were quite different from each other, representing a relatively moderate relationship (rho_{RSI}=0.56, rho_{DI}=0.66, rho_{ADI}=0.53, and rho_{RDI}=0.58). It is also seen from Table 4 and 5 that some highly specialized regions specified by the *RSI*, such as Adana in 2000; Kütahya, and Adana in 1990; Hatay in manufacturing in 2000 are also highly diversified regions specified by the *ADI (*Adana, specified also by the *RDI* index). Furthermore, one can identify the region of Izmir as the most diversified region in the country since both absolute and relative indices of diversity take the highest values for Izmir. These results of measuring specialization and diversity

Table 4. Ten most specialized and diverse regions, 1990

Specialized Regions				**Diverse Regions**				**Specialized Regions (Manufacturing)**				**Diverse Regions (Manufacturing)**			
RSI		*DIS*		*ADI*		*RDI*		*RSI*		*DIS*		*ADI*		*RDI*	
109,3	Adıyaman	0,99	Hakkari	12,89	İzmir	7,31	İzmir	14,19	Zonguldak	1,35	Rize	6,61	Kırşehir	8,33	İzmir
40,5	Batman	0,89	Şırnak	12,62	Eskişehir	5,96	Adana	9,57	Batman	1,04	Artvin	6,46	Elazığ	7,94	Adana
24,7	Zonguldak	0,78	Tunceli	12,47	Kütahya	5,91	Balıkesir	8,42	Hatay	1,04	Batman	6,26	Kocaeli	5,95	Aydın
17,4	Siirt	0,67	Siirt	12,45	Adana	5,66	Konya	7,46	Bilecik	1,02	Kırıkkale	6,08	Çankırı	5,26	K.Maraş
17,4	Elazığ	0,63	Kars	12,10	İstanbul	5,18	K.maraş	7,26	Artvin	0,96	Zonguldak	6,04	Mersin	4,03	Antalya
15,8	Artvin	0,63	Zonguldak	11,88	Bolu	4,92	Manisa	7,10	Kırıkkale	0,78	Muş	5,81	Mardin	3,90	Konya
15,2	Kütahya	0,61	Bingöl	11,85	Kocaeli	4,51	Denizli	6,25	Çorum	0,76	Bilecik	5,73	Yozgat	3,86	Şırnak
12,0	Sivas	0,58	Muş	11,78	Afyon	4,50	Aydın	6,24	Rize	0,70	Uşak	5,58	Balıkesir	3,81	Manisa
9,9	Bilecik	0,56	Rize	11,78	Sakarya	4,08	Kayseri	5,93	Sinop	0,69	Çanakkale	5,48	Bolu	3,67	Tekirdağ
9,6	Adana	0,56	Ağrı	11,76	Konya	4,08	Tokat	5,53	Çanakkale	0,69	Ağrı	5,38	Kastamonu	3,66	Bursa

Table 5. Ten most specialized and diverse regions, 2000

Specialized Regions				**Diverse Regions**				**Specialized Regions (Manufacturing)**				**Diverse Regions (Manufacturing)**			
RSI			*DIS*	*ADI*		*RDI*		*RSI*			*DIS*	*ADI*		*RDI*	
38,5	Kırıkkale	1,16	Tunceli	12,65	İzmir	7,82	İzmir	16,48	Karabük	1,24	Rize	6,54	Osmaniye	6,62	İzmir
36,7	Adıyaman	1,12	Hakkari	12,62	Manisa	5,65	Adana	14,60	Zonguldak	1,09	Muş	6,30	Kırşehir	6,46	Adana
34,5	Zonguldak	1,04	Şırnak	12,37	Kocaeli	4,90	Konya	10,04	Gümüşhane	0,96	Batman	6,00	Muğla	4,40	Yalova
33,4	Karabük	0,85	Siirt	12,23	Adana	4,82	Balıkesir	8,69	Hatay	0,95	Artvin	5,91	Mardin	3,95	Niğde
27,2	Elazığ	0,83	Ardahan	12,05	Eskişehir	4,81	Manisa	7,43	Bilecik	0,91	Karaman	5,84	Bayburt	3,72	Bursa
24,0	Bartın	0,81	Bingöl	11,81	Sakarya	4,38	Kayseri	6,30	Kütahya	0,89	Karabük	5,75	Antalya	3,50	Isparta
22,4	Adana	0,71	Kars	11,63	Mersin	4,30	Niğde	6,05	Batman	0,85	Giresun	5,74	Burdur	3,29	Mersin
22,1	Artvin	0,71	Muş	11,59	İstanbul	4,09	Aydın	5,88	Rize	0,84	Kırıkkale	5,71	Hatay	3,03	Aydın
21,3	Batman	0,69	Ağrı	11,50	Bolu	3,92	Mersin	5,59	Çanakkale	0,83	Çanakkale	5,70	Bartın	2,90	İstanbul
17,5	Kütahya	0,64	Bitlis	11,47	Kayseri	3,91	Eskişehir	5,31	Muş	0,82	Zonguldak	5,69	Balıkesir	2,87	Antalya

independently appear to be evidence for the facts claimed by Duranton and Puga (2000; 2001) that a region can be both diversified and specialized, and that diversified and specialized cities co-exist in a system of cities.

A comparison can be made between the measures because the rankings of regions differ noticeably from each other. For that reason, the Spearman rank correlation coefficients between the measures were computed, as applied by Dewhurst and McCann (2002). The statistical significance of the pairwise correlation coefficients (*rho*) were tested at 0.05 significance level, with critical Z value of 1.96 based on two-tailed test. The calculations revealed that the correlation between the rankings of the *ADI* and *RDI* for diversity was relatively high with a rho value of 0.80, however no relationship was found between the rankings of these measures in terms of manufacturing sectors. The rankings of the *RSI* and *DIS* for specialization were relatively weakly correlated (*rho*=0.22) regarding all non-agricultural sectors, but the correlation was relatively high, with a rho value of 0.71 for 2000 and 0.67 for 1990, concerning manufacturing sectors.

Additionally, a relatively strong negative relationship, with a 0.80 rho value, was found between the rankings of the *DIS* and *ADI* regarding non-agricultural sectors, and between the rankings of the *RSI* and *RDI* (*rho*=0.71 for 2000, and 0.60 for 1990) concerning manufacturing sectors. The relationships between the *RSI* and *ADI* were statistically insignificant, and the correlation coefficients between the *DIS* and *RDI* were equal to -1, since *RDI* is the inverse of *DIS*.

5.3. Specialization, Diversity and Size Relationships

There is an extensive literature which argues the link between the size of a regional economy and the level of specialization or diversity. Many of the empirical studies have found a strong evidence of a positive relationship between regional size and diversity (Marshall, 1975; Henderson, 1997; Guranton & Puga, 2000), and a negative relationship between regional size and specialization (Dewhurst & McCann, 2007); larger regions are more diversified while smaller regions are more specialized.

In order to examine the link between the size of regions and the levels of specialization and diversity, the values of the *RSI*, *DIS*, *ADI* and *RDI* were aggregated according to region size ranges. Then for each year, the average values of each region size group were calculated. These average values are reported in Table 6. Alternatively, the Spearman rank correlation coefficients between the measures and region size were computed, as used by Marshall (1975). In this analysis, region size was measured by size of both the urban population and employment. Given the statements that specialization decreases with region size, the rank correlation coefficients were expected to be negative, and that diversity increases with region size, the correlation coefficients were anticipated to be positive. Table 7 illustrates the results of rank correlation.

Table 6. Levels of specialization and diversity by region size

	# of regions		***RSI***		***DIS***		***ADI***		***RDI***		**% change**			
	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	***RS***	***DIS***	***ADI***	***RDI***
Non-agricultural														
Large (over 1 million)	5	7	3,73	5,04	0,26	0,27	11,52	11,18	4,42	4,33	35,1	0,6	-2,9	-2,1
Medium (0.5 to 1 million)	11	13	4,08	4,10	0,30	0,31	10,33	10,07	3,57	3,46	0,5	3,1	-2,5	-3,1
Small (under 0.5 million)	57	61	7,40	7,13	0,42	0,47	8,55	7,92	2,71	2,45	-3,6	11,4	-7,3	-9,9
Total	73	81	6,64	6,46	0,39	0,43	9,02	8,55	2,96	2,77	-2,7	8,7	-5,2	-6,4
Manufacturing														
Large (over 1 million)	5	7	1,56	1,58	0,28	0,33	4,25	4,14	5,04	3,73	1,7	20,5	-2,4	-26,0
Medium (0.5 to 1 million)	11	13	2,77	2,84	0,38	0,47	4,63	5,04	2,94	2,24	2,5	22,9	8,8	-23,7
Small (under 0.5 million)	57	61	3,20	3,58	0,52	0,60	4,06	4,49	2,24	1,86	11,8	15,0	10,5	-16,9
Total	73	81	3,03	3,29	0,49	0,56	4,16	4,55	2,54	2,08	8,7	14,9	9,3	-17,8

Table 6 is organized so that one can discern the specialization and diversity levels of large, medium and small size regions, but also the changes in the average values over the period 1990-2000. As can be seen, the trend is towards more specialization. Despite a slight decrease in the overall specialization level measured by the maximum LQ values (*RSI*), the dissimilarity index of specialization entails an increase in the overall degree of specialization by 8,7 %. The highest increase takes place in small size regions so that they are becoming more specialized. In manufacturing, it is the medium size regions which have the highest increase in the *DIS* values, and the small size regions have the highest increase in terms of the *RSI* values. Values of both the absolute and relative measures of diversity indicate a decrease in the level of diversity. However, the change in the level of diversity in manufacturing is quite contrasting with respect to diversity measures; the *RDI* values present a considerable decrease while the *ADI* values display an increase in the level of diversity.

In terms of the relationship between size and specialization, the average *RSI* and *DIS* values indicate that small size regions have the highest level of specialization, and large regions have the lowest degree. In the case of size-diversity relationship, it is seen that *ADI* and *RDI* values are lowest in small size regions, while the measures take the highest values in large regions. However, one can notice that the extent of diversity in manufacturing is higher in medium size regions than large size regions when measured by the absolute diversity measure in the form of inverse Hirschman-Herfindahl index.

Table 7. Rank correlation coefficients between specialization, diversity and size

		Non-agricultural				**Manufacturing**			
		Specialization		**Diversity**		**Specialization**		**Diversity**	
		RSI	*DIS*	*ADI*	*RDI*	*RSI*	*DIS*	*ADI*	*RDI*
Urban Pop.	ρ_{2000}	-0,12	-0,50*	0,45*	0,50*	-0,36*	-0,31*	0,00	0,31*
	ρ_{1990}	-0,11	-0,57*	0,55*	0,57*	-0,19	-0,37*	0,22	0,30*
Emp	ρ_{2000}	-0,11	-0,54*	0,57*	0,54*	-0,40*	-0,35*	0,03	0,35*
	ρ_{1990}	-0,10	-0,58*	0,63*	0,58*	-0,18	-0,35*	0,24*	0,30*

* Statistically significant at 0.05 significance level

That negative relationship between size and specialization, and the positive relation between size and diversity are also confirmed by the Spearman rank correlation test. Examining the Table 7, it can be said that the levels of statistically significant association between size and specialization/diversity are moderate since the values of Spearman's rho ranging from 0,45 to 0,63.

In terms of manufacturing, the relationship is weaker that rho values are ranging between 0,24 and 0,40. On the other hand, no statistically significant relationship is found between the rankings of *RSI* values and size rankings, and between size and the *ADI* values in manufacturing. The relationship is also insignificant regarding the *RSI* values in manufacturing for 1990. Lastly, it can be said that measuring region size by employment rather than urban population is more appropriate since correlation coefficients are relatively higher though the differences are small.

5.4. Sensitivity Analysis

The considerations included in Section 2, and the findings presented in the previous sub-sections highlight that the results of analyses are very sensitive to the measure employed. Similarly, one can also expect that the results would differ when regional specialization and diversity are measured at different levels of sectoral disaggregation.

The calculated values given in Table 8 shed light on the extent of the differences related to the disaggregation level. It is clearly seen that the more disaggregated the employment data, the higher the values of *RSI*, *DIS* and *ADI*, and the lower the values of *RDI*. In other words, the values of the *RSI* and *DIS* indices, representing the level of regional specialization, increase as the level of disaggregation of the employment data increases. For example; the average of the *RSI* index values of 76 regions takes the value of 2.26 at one-digit level, 9.77 at two-digit level, 25.55 at three-digit level and 33.22 at four-digit level. Denoting the level of regional diversity, the *ADI* values increase but the *RDI* values decrease when the employment data become more disaggregated.

The rankings of regions can be expected to differ with respect to the level of disaggregation. For that reason, the Spearman rank correlation coefficients between the disaggregation levels were computed for each measure. The calculations revealed that the correlation between the rankings was relatively high for the measures of the *DIS* and *ADI;* the correlations were highest between four and three digit-level and declined as the level of disaggregation decreased. Between four and three digit-level, rho_{DIS}= 0.99 and rho_{ADI}=0.95; between three and two digit-level, rho_{DIS}= 0.98 and rho_{ADI}=0.93; and between two and one digit-level, rho_{DIS}= 0.87 and rho_{ADI}=0.76. However, in terms of the *RSI* index the correlations were relatively lower and differing in pattern, as: $rho_{four\ \&\ three\ digit}$= 0.67, $rho_{three\&two\ digit}$=0.81 and $rho_{two\ \&\ one\ digit}$= 0.30.

6. CONCLUSION

This paper set out to investigate the regional employment structures and the changes in these sectoral compositions, and to examine the links between size of regions and their sectoral compositions. It has shown that the provinces specialized in sectors dependent on natural resources have been the most

Table 8. Regional values at different levels of sectoral disaggregation

	Index	**Level of Sec. Disagg**	**Total** (ave. of 76 regions)	**Large Regions** (ave. of 5 regions)	**Medium Regions** (ave. of 11 regions)	**Small Regions** (ave. of 60 regions)
Regional Specialization	***RSI***	One-digit	2,26	2,12	1,60	2,39
		Two-digit	9,77	5,57	6,86	10,65
		Three-digit	25,55	8,93	12,16	29,38
		Four-digit	33,22	9,03	18,21	37,99
	DIS	One-digit	0,28	0,18	0,22	0,30
		Two-digit	0,42	0,27	0,33	0,45
		Three-digit	0,48	0,31	0,39	0,52
		Four-digit	0,52	0,34	0,43	0,56
Regional Diversity	***ADI***	One-digit	3,26	3,83	3,16	3,23
		Two-digit	5,71	8,55	6,23	5,38
		Three-digit	12,68	18,48	14,40	11,88
		Four-digit	19,17	29,57	22,67	17,65
	RDI	One-digit	4,30	6,59	4,99	3,99
		Two-digit	2,63	4,06	3,32	2,38
		Three-digit	2,24	3,49	2,68	2,06
		Four-digit	2,05	3,12	2,43	1,89

specialized regions. The majority of large size regions have reflected a change in their profiles whereas medium size regions have remained stable in their sectoral composition, including their manufacturing profile. Moreover, the study has shown that the rankings of the regions with respect to levels of specialization and diversity have also remained relatively stable over time. The outcome of measuring specialization and diversity independently has revealed the fact suggested in the literature that a region could be both diversified and specialized.

The results point out a tendency towards more specialization in Turkey. This finding, especially for manufacturing, is consistent with those of Akgüngör and Falcıoğlu (2005) who measured regional specialization at the two-digit manufacturing sectors, and Falcıoğlu and Akgüngör (2008) who measured regional specialization at the 4-digit manufacturing sectors, by using the Gini coefficient and for 26 NUTS 2 Turkish regions. This study also confirms that regional specialization is negatively, and regional diversity is positively related to region size.

As emphasized by Dewhurst and McCann (2007) the empirical results of specialization and diversity analysis based on employment data are very sensitive to the level of sectoral aggregation used; the scheme of Standard Industrial Classification (SIC) employed; the indices utilized and the spatial unit of analysis chosen. The results, therefore, need to be interpreted with caution. The outcomes of the current study are based on the available provincial employment data at two-digit sectoral aggregation classified according to ISIC Rev.2, which is limited to just 30 non-agricultural economic activities: 4 mining and quarrying, 9 manufacturing and 17 service sectors. It is also attempted in this study to demonstrate the sensitivity of the results of analyses with respect to the level of disaggregation of the employment data. Since it is based on another set of employment data, that exercise reveals further differences. Precisely speaking, the first set of data is classified according to ISIC Rev.2, while the second one is classified according to NACE Rev.1.1, a more detailed scheme of industrial classification. Secondly, the source of the first set of data is the CP, and the source of the second set of data is the GSIBE. This means that the results of analyses are sensitive to the source of data since each census has different aim and method of data collection.

Finally, an in depth understanding of the dynamics of specialization and diversity, and of the benefits and detriments offered by them is crucial for the process of formulating and implementing regional growth and development policies. Besides calling attention to the extent of problems associated with using employment data in measuring specialization and diversity, this paper may offer some insight into regional economic structures in Turkey, and may serve as a base for future studies such as exploring the influence of sectoral compositions (including both manufacturing and service industries) of regions on their growth patterns and economic performances, and also investigating the roles of regions within the whole system with respect to their size.

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Table A1. Sectoral specialization by regions and region size categories

		1990			2000			%	Sec.
Size	Regions	Sectors	Rank	*RSI*	*RSI*	Rank	Sectors	change in *RSI*	of Spe.
(over 1 million)	İstanbul	34	(63)	1,93	2,30	(61)	39	18,9	*ch*
	Ankara	96	(33)	3,51	2,97	(43)	22	-15,4	ch
	Izmir	92	(72)	1,59	1,51	(80)	35	-4,7	ch
	Bursa	32	(62)	2,02	2,09	(64)	38	3,3	*ch*
	Adana	96	(10)	9,60	22,40	(7)	96	133,4	*unch*
	Konya	23	(36)	3,07	1,80	(71)	37	-41,4	ch
	Antep	32	(66)	1,80	2,21	(62)	32	22,7	*unch*
(0.5 to 1 million)	Mersin	61	(68)	1,69	1,52	(79)	61	-10,3	unch
	Antalya	63	(34)	3,29	3,91	(30)	63	18,9	*unch*
	Urfa	50	(69)	1,66	1,69	(75)	91	1,5	*ch*
	Diyarbakır	22	(14)	8,05	2,34	(60)	22	-70,9	unch
	Kayseri	23	(19)	5,81	4,38	(23)	23	-24,6	unch
	Kocaeli	35	(20)	5,14	4,23	(27)	35	-17,8	unch
	Manisa	21	(31)	3,56	5,95	(18)	21	67,3	*unch*
	Samsun	31	(48)	2,38	1,65	(77)	31	-30,6	unch
	Hatay	37	(12)	8,45	7,57	(14)	37	-10,4	unch
	Balıkesir	29	(26)	4,06	6,17	(17)	29	52,0	*unch*
	Erzurum	91	(57)	2,11	3,13	(37)	42	48,2	*ch*
	Eskişehir	29	(13)	8,28	5,11	(21)	29	-38,4	unch
	K.Maraş	23	(17)	6,54	5,67	(20)	41	-13,2	ch
(under 0.5 million)	Malatya	91	(71)	1,62	1,68	(76)	93	4,0	*ch*
	Aydın	63	(67)	1,71	1,70	(74)	63	-0,6	unch
	Trabzon	31	(56)	2,12	1,79	(72)	72	-15,7	ch
	Sakarya	38	(65)	1,82	3,08	(38)	29	69,6	*ch*
	Van	72	(50)	2,21	2,50	(52)	91	13,0	*ch*
	Sivas	23	(8)	12,00	12,52	(11)	23	4,3	*unch*
	Ordu	31	(55)	2,12	1,87	(70)	50	-12,1	ch
	Denizli	32	(59)	2,08	2,94	(44)	32	41,3	*unch*
	Tokat	31	(61)	2,04	2,20	(63)	31	7,5	*unch*
	Tekirdağ	36	(52)	2,16	2,55	(50)	32	17,8	*ch*
	Mardin	91	(47)	2,41	3,02	(39)	22	25,4	*ch*
	Afyon	36	(23)	4,34	6,66	(15)	22	53,4	*ch*
	Elazığ	23	(5)	17,35	27,23	(5)	23	56,9	*unch*
	Adıyaman	22	(1)	109,33	36,72	(2)	22	-66,4	unch
	Kütahya	21	(7)	15,18	17,55	(10)	21	15,6	*unch*
	Yozgat	93	(70)	1,65	3,90	(31)	23	135,5	*ch*
	Osmaniye				3,00	(41)	37		
	Çorum	36	(21)	4,90	4,26	(26)	36	-13,1	unch
	Batman	22	(2)	40,47	21,32	(9)	22	-47,3	unch
	Isparta	29	(28)	3,64	1,72	(73)	72	-52,7	ch
	Kırıkkale	35	(15)	7,78	38,54	(1)	22	395,1	*ch*

Table A1. Continued

Size	Regions	1990 Sectors	1990 Rank	1990 *RSI*	2000 *RSI*	2000 Rank	2000 Sectors	% change in *RSI*	Sec. of Spe.
(under 0.5 million)	Giresun	23	(27)	3,93	2,47	(53)	31	-37,1	ch
	Muğla	41	(30)	3,59	3,54	(33)	63	-1,6	ch
	Ağrı	91	(44)	2,65	2,73	(48)	91	3,1	*unch*
	Zonguldak	21	(3)	24,68	34,53	(3)	21	39,9	*unch*
	Edirne	21	(46)	2,45	2,60	(49)	21	6,3	*unch*
	Bitlis	29	(45)	2,57	2,41	(55)	91	-6,2	ch
	Çanakkale	36	(22)	4,68	4,33	(24)	36	-7,5	unch
	Şırnak	91	(29)	3,60	3,92	(29)	91	8,8	*unch*
	Rize	31	(11)	8,64	5,92	(19)	31	-31,5	unch
	Aksaray	50	(73)	1,55	1,45	(81)	50	-6,6	unch
	Amasya	21	(51)	2,19	2,08	(65)	91	-4,7	ch
	Kırklareli	22	(39)	2,84	2,97	(42)	22	4,6	*unch*
	Uşak	32	(37)	3,03	2,75	(47)	32	-9,2	unch
	Kastamonu	23	(24)	4,16	10,82	(12)	23	159,9	*unch*
	Erzincan	23	(18)	5,96	2,38	(57)	91	-60,0	ch
	Muş	31	(58)	2,09	2,38	(58)	91	13,8	*ch*
	Karabük				33,42	(4)	23		
	Siirt	22	(4)	17,42	3,42	(34)	91	-80,3	ch
	Kırşehir	41	(53)	2,14	2,08	(67)	41	-2,7	unch
	Bolu	33	(49)	2,25	2,08	(66)	31	-7,4	ch
	Kars	91	(40)	2,82	3,01	(40)	91	6,8	*unch*
	Çankırı	72	(41)	2,77	2,46	(54)	29	-11,1	ch
	Karaman	21	(32)	3,53	6,47	(16)	21	83,2	*unch*
	Burdur	29	(42)	2,70	2,55	(51)	36	-5,6	ch
	Hakkari	91	(25)	4,16	4,26	(25)	91	2,4	*unch*
	Nevşehir	29	(35)	3,07	1,99	(69)	29	-35,4	unch
	Düzce				2,78	(46)	37		
	Niğde	23	(43)	2,69	1,65	(78)	29	-38,8	ch
	Bilecik	36	(9)	9,94	10,49	(13)	36	5,6	*unch*
	Bingöl	91	(60)	2,06	3,15	(36)	91	53,3	*unch*
	Sinop	96	(16)	6,67	3,66	(32)	36	-45,2	ch
	Yalova				2,37	(59)	50		
	Artvin	23	(6)	15,75	22,11	(8)	23	40,3	*unch*
	Iğdır				2,41	(56)	91		
	Gümüşhane	41	(64)	1,90	3,95	(28)	39	108,4	*ch*
	Kilis				2,82	(45)	39		
	Tunceli	91	(38)	2,98	4,41	(22)	91	48,0	*unch*
	Bartın				23,97	(6)	21		
	Bayburt	50	(54)	2,13	2,05	(68)	72	-3,8	ch
	Ardahan				3,30	(35)	91		

*ch – sector of specialization changed
*unch – sector of specialization unchanged
*italic letters indicate an increase in the level of specialization

Table A2. Specialization in manufacturing by regions and region size

		1990			2000			%	Sec.
Size	Regions	Sectors	Rank	*RSI*	*RSI*	Rank	Sectors	change in *RSI*	of Spe.
(over 1 million)	İstanbul	34	66	1,43	1,63	74	38	13,9	*ch*
	Ankara	33	33	2,47	2,19	53	33	-11,1	unch
	Izmir	35	69	1,32	1,31	77	35	-0,3	unch
	Bursa	32	72	1,26	1,23	79	38	-2,4	ch
	Adana	38	71	1,31	1,22	80	33	-6,6	ch
	Konya	37	24	2,85	1,92	65	37	-32,6	unch
	Antep	32	64	1,45	1,57	75	32	8,5	*unch*
(0.5 to 1 million)	Mersin	36	54	1,71	1,96	62	36	14,9	*unch*
	Antalya	33	40	2,03	1,98	61	33	-2,1	unch
	Urfa	31	41	2,01	2,40	43	31	19,5	*unch*
	Diyarbakır	31	45	1,94	2,29	48	31	18,2	*unch*
	Kayseri	32	68	1,37	2,84	32	33	106,4	*ch*
	Kocaeli	35	15	3,79	3,19	23	35	-15,7	unch
	Manisa	36	39	2,14	2,07	58	36	-3,4	unch
	Samsun	31	26	2,80	2,29	47	31	-18,2	unch
	Hatay	37	3	8,42	8,69	4	37	3,2	*unch*
	Balıkesir	31	51	1,82	2,30	45	31	26,6	*unch*
	Erzurum	31	37	2,36	2,62	38	31	11,0	*unch*
	Eskişehir	36	44	1,99	2,46	40	36	24,0	*unch*
	K.Maraş	31	73	1,20	1,87	66	38	56,1	*ch*
(under 0.5 million)	Malatya	31	38	2,20	2,13	54	31	-3,2	unch
	Aydın	33	70	1,31	1,68	73	31	28,7	*ch*
	Trabzon	31	25	2,81	2,99	28	31	6,4	*unch*
	Sakarya	38	47	1,87	1,72	72	38	-8,4	unch
	Van	31	42	1,99	2,45	41	31	23,3	*unch*
	Sivas	37	14	3,95	1,94	63	36	-50,8	ch
	Ordu	31	34	2,43	2,71	36	31	11,6	*unch*
	Denizli	32	58	1,61	1,80	70	32	11,8	*unch*
	Tokat	31	43	1,99	3,06	25	31	54,1	*unch*
	Tekirdağ	36	50	1,82	1,49	76	32	-18,3	ch
	Mardin	36	22	2,99	2,71	35	36	-9,4	unch
	Afyon	36	11	4,20	4,71	13	36	12,2	*unch*
	Elazığ	37	19	3,42	2,62	39	31	-23,4	ch
	Adıyaman	31	49	1,84	2,05	59	31	11,0	*unch*
	Kütahya	36	13	3,96	6,30	6	36	58,8	*unch*
	Yozgat	36	27	2,71	2,25	52	36	-16,9	unch
	Osmaniye				4,66	14	37		
	Çorum	36	7	6,25	5,01	12	36	-19,8	unch
	Batman	35	2	9,57	6,05	7	35	-36,8	unch
	Isparta	32	53	1,72	2,12	55	36	23,1	*ch*
	Kırıkkale	35	6	7,10	0,35	81	38	-95,0	ch

Table A2. Continued

Size	Regions	1990			2000			% change in *RSI*	Sec. of Spe.
		Sectors	Rank	*RSI*	*RSI*	Rank	Sectors		
(under 0.5 million)	Giresun	31	31	2,50	3,79	18	31	51,7	*unch*
	Muğla	34	28	2,61	2,62	37	36	0,6	*ch*
	Ağrı	31	32	2,49	3,77	19	31	51,3	*unch*
	Zonguldak	37	1	14,19	14,60	2	37	2,9	*unch*
	Edirne	38	48	1,85	1,94	64	31	5,2	*ch*
	Bitlis	31	23	2,86	3,32	21	31	16,1	*unch*
	Çanakkale	36	10	5,53	5,59	9	36	1,0	*unch*
	Şırnak	33	67	1,39	2,27	50	38	64,1	*ch*
	Rize	31	8	6,24	5,88	8	31	-5,7	unch
	Aksaray	32	65	1,45	1,82	69	31	25,9	*ch*
	Amasya	31	18	3,49	3,20	22	31	-8,3	unch
	Kırklareli	36	20	3,15	1,85	67	36	-41,5	unch
	Uşak	32	46	1,93	1,82	68	32	-5,4	unch
	Kastamonu	33	35	2,42	2,87	31	33	18,6	*unch*
	Erzincan	31	36	2,36	3,01	27	31	27,4	*unch*
	Muş	31	12	4,03	5,31	10	31	31,7	*unch*
	Karabük				16,48	1	37		
	Siirt	36	16	3,78	2,82	34	36	-25,4	unch
	Kırşehir	35	21	3,14	2,84	33	35	-9,7	unch
	Bolu	33	30	2,52	2,11	57	31	-16,2	ch
	Kars	32	56	1,66	3,04	26	31	82,6	*ch*
	Çankırı	36	52	1,81	2,30	46	31	27,0	*ch*
	Karaman	31	29	2,57	4,56	15	31	77,7	*unch*
	Burdur	31	59	1,61	3,15	24	36	95,4	*ch*
	Hakkari	32	60	1,59	2,02	60	33	27,1	*ch*
	Nevşehir	36	17	3,65	2,88	30	36	-20,9	unch
	Düzce				2,42	42	37		
	Niğde	32	57	1,65	1,74	71	31	5,4	*ch*
	Bilecik	36	4	7,46	7,43	5	36	-0,4	unch
	Bingöl	31	63	1,45	2,11	56	31	45,3	*unch*
	Sinop	36	9	5,93	5,15	11	36	-13,1	unch
	Yalova				1,28	78	37		
	Artvin	37	5	7,26	3,84	17	37	-47,1	unch
	Iğdır				2,93	29	31		
	Gümüşhane	33	62	1,58	10,04	3	38	535,6	*ch*
	Kilis				4,32	16	38		
	Tunceli	31	55	1,70	2,30	44	38	35,3	*ch*
	Bartın				3,57	20	36		
	Bayburt	33	61	1,58	2,29	49	36	44,7	*ch*
	Ardahan				2,27	51	38		

*ch – sector of specialization changed
*unch – sector of specialization unchanged
*italic letters indicate an increase in the level of specialization

Table A3. International Standard Industrial Classification Rev.2

Code	Sector Classification	Code	Sector Classification
21	Coal mining	50	Construction
22	Crude petroleum and natural gas production	61	Wholesale trade
23	Metal ore mining	62	Retail Trade
29	Other mining and quarrying	63	Restaurants and hotels
31	Food, beverages and tobacco	71	Transportation and Storage
32	Textile, wearing apparel and leather industries	72	Communication
33	Wood and wood products, including furniture	81	Financial institutions
34	Paper and paper products, printing and publishing	82	Insurance
35	Chemical, petroleum, coal, rubber, plastic products	83	Real estate
36	Non-metallic mineral products	91	Public administration and defence
37	Basic metal industries	92	Sanitary and similar services
38	Fabricated metal products, machinery, equipment	93	Social and community services
39	Other manufacturing industries	94	Recreational and cultural services
41	Electricity, gas and steam	95	Personal and household services
42	Water works and supply	96	International and extraterritorial bodies