

Deniz, Zühal Çelebi

Conference Paper

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53rd Congress of the European Regional Science Association: "Regional Integration: Europe, the Mediterranean and the World Economy", 27-31 August 2013, Palermo, Italy

Provided in Cooperation with:

European Regional Science Association (ERSA)

Suggested Citation: Deniz, Zühal Çelebi (2013) : Rank-Size Distribution Of Turkey And Trc2 Nuts-2 (Diyarbakir-S,Anliurfa) Region, 53rd Congress of the European Regional Science Association: "Regional Integration: Europe, the Mediterranean and the World Economy", 27-31 August 2013, Palermo, Italy, European Regional Science Association (ERSA), Louvain-la-Neuve

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RANK-SIZE DISTRIBUTION OF TURKEY AND TRC2 NUTS-2 (DIYARBAKIR-ŞANLIURFA) REGION

Z. ÇELEBİ DENİZ¹

Abstract

Inter-regional disparities are seen intensively at east-west direction in Turkey. Migration as a basic consequence of regional disparities, has been a problem for Turkey since the 1950s. TRC2 NUTS-2 Region consisting of Diyarbakır and Şanlıurfa, two major centers of Southeast Anatolia, is among those which face this problem the most deeply due to get immigration from its own region and migrate to the west region of Turkey. Diyarbakır and Şanlıurfa identified as growth centers at the national level policies in order to shift migration waves within the region.

In this study; urbanization and city size distribution in Turkey were examined, and then changes of the rank size distribution of Diyarbakır region in 1970-2010 period were analyzed. Diyarbakır region receives mass migration and unable to keep this migration within the region due to the lack of employment opportunities and migrate to the metropolitan cities of Turkey.

As method of the study, rank size rule was used in order to analyze rank size distribution of Diyarbakır and Şanlıurfa. According to results Diyarbakır seems to be primate city and tends to increase this role in the period of 1970-2010. In this period, medium-sized cities also tend to grow with the effect of attractive and push factors in the region. According to the rank-size distribution of Şanlıurfa, the city center and medium-sized cities have grown up in a polycentric way in this period.

In light of findings from the study, investment for regional center and district centers which gets migration should be done and for small and rural settlements measures should be taken to improve the quality of life. In order to create a balanced settlements system and ensure healthy urbanization in the region; social integration, increase in employment and ensuring adequate physical infrastructure policies are crucial for regional centers and medium-sized cities that will serve as sub-central areas.

¹ Zühal ÇELEBİ DENİZ, İstanbul Technical University - Karacadag Development Agency.
Tel: +90 412 2371216, Fax: +90 412 2371214, zcelebi@itu.edu.tr, zuhalcelebi16@gmail.com

Keywords: *City size, rank-size distribution, city growth, migration, development.*

1. Introduction

1.1 Purpose of the Study and Methodology

The aim of this study is to examine the change of city size distribution over time and urbanization trends in the period of 1970-2010 both for Turkey and NUTS-2 region consisting of Diyarbakır and Şanlıurfa, two major centers of Southeast Anatolia Region, having big disparities in Turkey.

In order to find out the size distribution and urbanization trend of Turkey over the period of 1970-2010; firstly we examine city growth in different levels, then size distribution of the cities by using rank size rule (Zipf's law) model. Secondly, we examine changes in city size of Diyarbakır and Şanlıurfa, rapidly urbanization trends of cities depends on high-migration effects from rural areas. Then we examine distribution of the cities in Diyarbakır-Şanlıurfa region by using rank size rule model during 1970-2010. In addition, it is intended to interpret functional changes of cities during this period.

In this article first section presents aim of the study and methodology and literature background. Second section includes brief descriptive information about city growth, former and new central places studies in Turkey and then distribution of the cities in Turkey by using Zip's law. Third section gives detailed information about city population growth, rapid urbanization process, functional relationships between cities and distribution of the cities in Diyarbakır-Şanlıurfa NUTS 2 region' centers during the period of 1970-2010. This section provides the findings of empirical analysis based on Zipf's law for Diyarbakır and Şanlıurfa centers and comparison of results. At the end, the fourth section gives conclusion and recommendations.

1.2 Literature

The rank-size distribution represents a model for evaluating a system of settlements (a functional region or an entire country) that are undergoing changes in population. If cities are ranked according their population size, an inversely proportional direct relation between logarithm of rank and size value is observed. This empirical fact is known as Zipf's law or rank size rule. Because of it gives very strong empirical support, rank size rule is one of the

well-known approaches to explain the size distribution of cities for many countries. There are many ways of expressing the Zipf's Law, one of them is as follows (Dökmeci, 1986);

The Formula is:

$$P_R = \frac{P_1}{R^q} q$$

Where **P1** is population of the largest city, **PR** is population of the city of rank **R**, **R** is rank of the city with respect to size, **q** is constant. Calculation with logarithms gives the following equation;

$$\text{Log PR} = \text{Log P1} - q \text{ Log R}$$

During the last two decades, an extensive literature has developed on city-size dynamics by the use of Zipf's law in developed and developing countries. With respect to developing countries, one of the examples of rank-size distribution of cities is illustrated in France by Guerin-Pace (1995). From data on cities' population covering almost two centuries, the viability of rank-size parameters for describing the evolution of city size distributions is tested. Development of middle size cities based on industrial and economic development effected the adjustment of the city system to the rank-size rule. The comparison of city systems of France and Japan is given by Eaton and Eckstein (1997). According to their results, the relative populations of the top 40 urban areas of France and Japan remained very constant during these countries' periods of industrialization and urbanization, and are described quite well by the 'rank-size rule.' In one another study, Giesen and Südekum (2011) illustrated that the rank-size rule for city sizes is not only satisfied for Germany's national urban hierarchy, but also in single German Regions.

With respect to developing countries, Dökmeci (1986) applied rank-size rule to city distribution system in Turkey between the years 1945-1975. Attention is given to changes over time in the national rank-size distribution of cities as well as in various regions. In a more recent study, Zeyneloglu et al. (2005) illustrated perfect adjustment of the urban system to the rank-size distributions of cities in Turkey. In another study, Thomas (1985) applied rank-size rule successfully to the distribution of cities in Poland with $R^2=0.99$. In a more recent study, Schaffar and Dimou (2012) study the dynamic patterns of urban hierarchies within the two most populated countries in the world, China and India. Their results are within the concept of rank-size rule. During the period 1981-2004, both countries turned away from state-owned and state-ruled economies towards a market economy and opened to

international competition and foreign direct investment. In India, these changes took place without any major institutional shock affecting the country's demographics. However in China, a series of economical reforms have abolished the prevailing cross-region labor mobility restrictions, except for the biggest metropolitan areas, and stimulated interregional migration flows which effected city size distribution.

2. Settlements and City-Size Distribution of Turkey

Turkey is composed of 12 regions at the level of NUTS-1, 26 regions at the level of NUTS-2, and 81 provinces at the level of NUTS-3. The country has big interregional disparities at the direction of the east-west. TRC2 NUTS 2 region composed of Diyarbakır and Şanlıurfa is seen below.

Map 1 - NUTS-2 Regions in Turkey and TRC2 NUTS-2 Region



As a result of disparities between regions, migration has been a big problem in Turkey since 1950's. The urbanization rate has increased more rapidly especially since 1980's. After 1980's there was great migration from Diyarbakır and Şanlıurfa to metropolitan west cities and at the same time from Southeast Anatolian Region to Diyarbakır and Şanlıurfa. This migration waves brings with it many problems with regard to well balanced cities and healthy urbanization in eastern as well as western cities.

It can be said that general trend of urbanization dynamics heavily affected by migration at the direction of rural to urban and medium-sized cities to metropolitan cities in Turkey. Data

shows that both population growth and urbanization rate are above Turkey's average in the metropolitan cities.

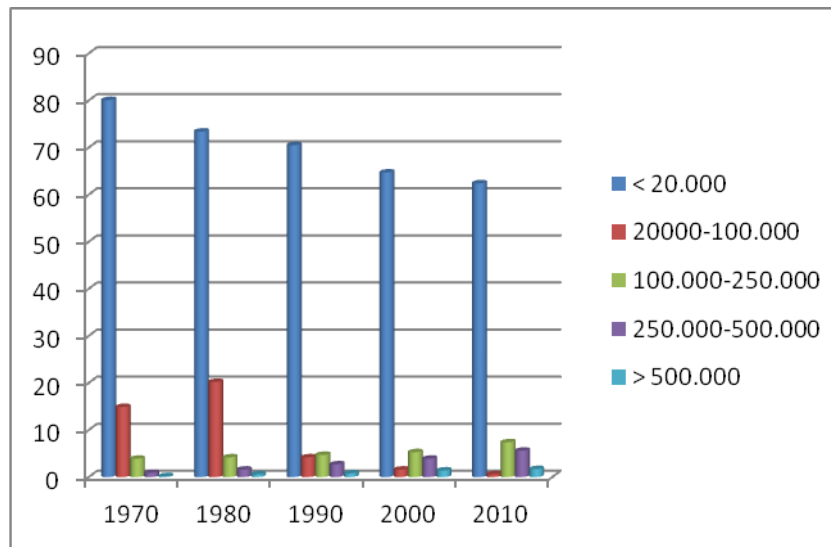
Table 1- City-Size Distribution in Turkey

Years	< 20.000	20000-50.000	50000-250.000	250.000-500.000	> 500.000	Total
1970	511	95	25	6	1	638
1980	468	129	27	10	4	638
1990	630	191	42	24	7	894
2000	597	228	49	36	13	923
2010	597	71	71	54	16	957

Source: TURKSTAT, 2012.

As a result, today number of large cities and their share in total population are increasing while population share of small cities is declining. Table 1 shows the size of settlements and population shares in the period of 1970-2010.

Graph 1- Change in City Size of Turkey Between 1970-2010

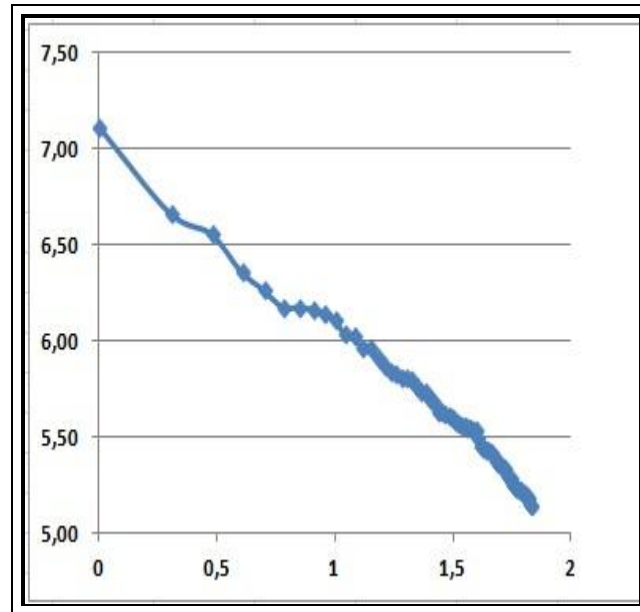


Source: TURKSTAT, 2012.

Graph 1 shows number of small settlements the population of which under 20,000 decreased while number of cities the population of which lies between 100,000 and 500,000 increased in 1970-2010 period. It can be said that population share of medium-sized and large cities increased over time. The urbanization rate of Turkey was around 44% in 1980, while it was around 65% in 2000 and 74% in 2012.

Rank-size distribution of cities in Turkey is analyzed with Zip's law. The rank-size distribution of cities shown below on Graph 2. According to the Graph 2, slope of the linear distribution of cities is -1 in Turkey, so it can be seen the distribution system of Turkey is in line with developed countries. Although Turkey is a developing country, it has a well balanced distribution and rank size because of its historical trade and urbanization background.

Graph 2- Rank-size distribution of cities in Turkey



Source: TURKSTAT, 2012.

According to the first study examining the size distribution of cities in Turkey (Dökmeci, 1986); Turkey has -0.75 slope of the linear distribution of cities in 1945, -0.90 in 1975, and finally reached to -1 in 1990. Turkey's linear distribution has still the same slope value today.

2.1 Central Places of Turkey

In *Hierarchy of Settlement Centers in Turkey*, which is the first study examining hierarchy of settlements centers in Turkey made by State Planning Organization in 1982; settlements serve as central places. According to this system there is seven stages as shown below:

Table 2- Hierarchy units of Settlement Centers in Turkey

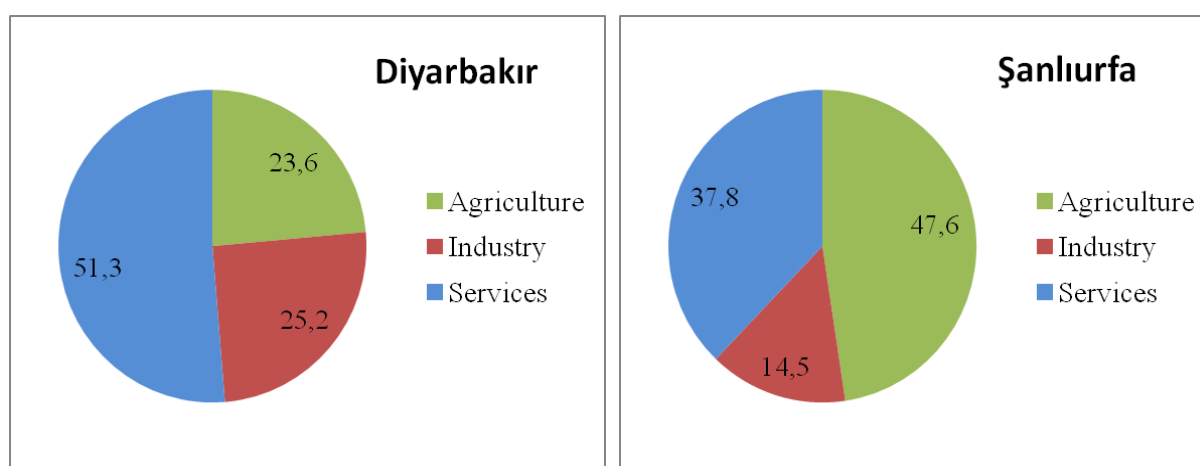
Stages	Unit number	Property	Function
1	35.118	Rural Settlement	Agricultural production
2	1267 (+78)*	Village Group Center (Town)	Trade / Service / Agricultural Production
3	416 (+88)	Urban Central (County)	Trade / Service / Non-agricultural production
4	53 (+5)	Provincial Center (City)	Trade / Service / Industry
5	11	Regional Center	Sub-regional scale of Commerce, Industry and Services: <i>Bursa, Eskişehir, Konya, Kayseri, Diyarbakır, Samsun, Sivas, Erzurum, Malatya, Elazığ ve Trabzon.</i>
6	3 (+1)	Regional Metropolis	Metropolitan Functions: <i>Ankara, İzmir, Adana, (Gaziantep)</i>
7	1	Territorial Metropolis	National and Transnational Functions: <i>İstanbul</i>

Source: SPO, 1982.

* The numbers in parentheses represent the settlements identified as intermediate.

In this system Istanbul is identified as national metropolis, Diyarbakır as a regional center and Şanlıurfa is identified as a sub-regional center. 5th stage including Diyarbakır as regional centers and their hinterlands form functional regions. In parallel this classification, sectoral composition of the two city economies differ from each other. Depending on being regional center, services sector has the biggest share of employment in Diyarbakır, while agriculture has still a big share in Şanlıurfa's economy.

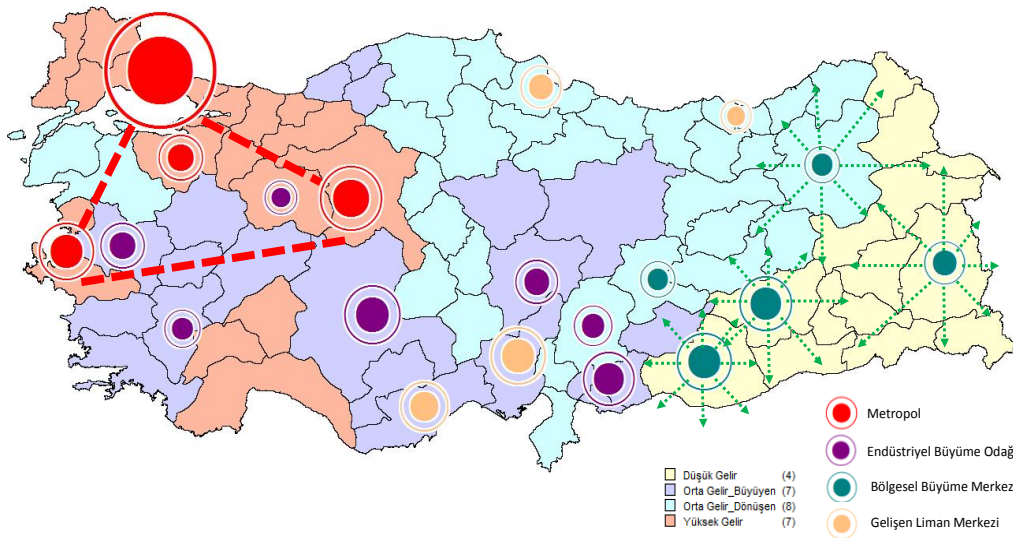
Graph 3-4- Sectoral Distribution of Employment



Source: TURKSTAT, 2013.

According to a recent study examining the current status of the settlement system in Turkey (Zeyneloğlu, 2008), two groups of cities were identified that the urban population doubled in the period of 1975-2000: The first group consists of *industrialized cities* of the western regions while the second group includes "*Diyarbakir, Sanliurfa, Batman, Kiziltepe, Siverek and Viransehir*" cities located in Southeast Anatolia, which are exposed to *high migration and rapidly urbanization* in this period.

Map 2- City Classification in Regional Development National Strategy



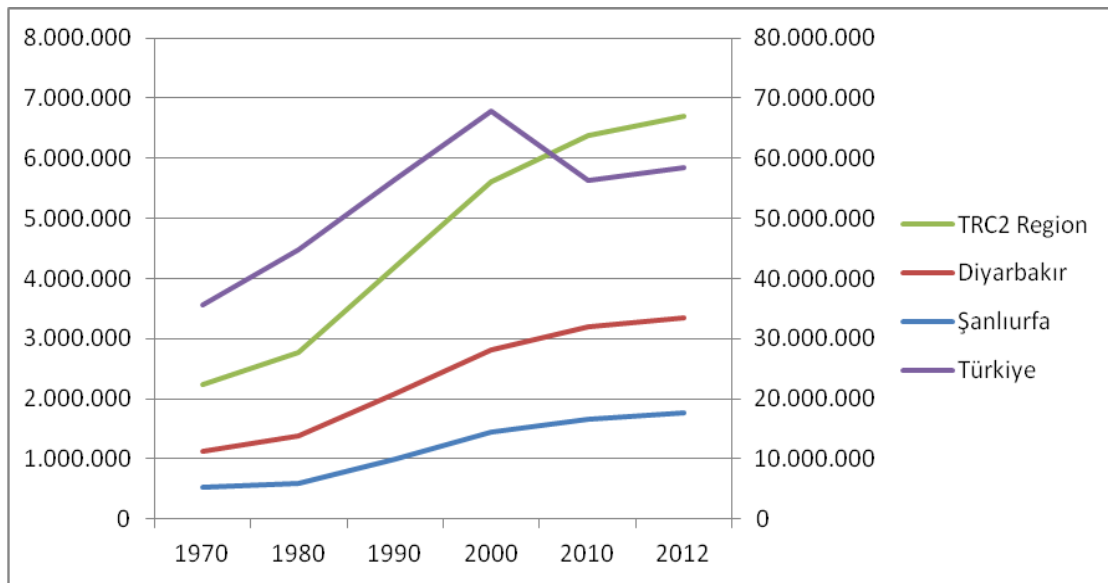
Source: Ministry of Development, 2012.

In order to provide well balanced settlement system in Regional Development National Strategy, where Istanbul, Ankara and Izmir are determined as metropolitan cities, Diyarbakir and Şanlıurfa are determined as regional growth centers for socio-economic development in Southeast Anatolia region.

3. City-Size Distribution of TRC-2 Region

TRC2 region is at the rank of 23 in 26 NUTS-2 regions and Diyarbakır is at the rank of 67 and Şanlıurfa is at the rank of 73 among 81 provinces with respect to socio-economic development. Otherwise TRC2 region have big potential regarding accessibility, infrastructure, agriculture, urbanization economies and labor force. Because of less development handicapped, city growth in TRC2 region is mainly related to migration from rural areas.

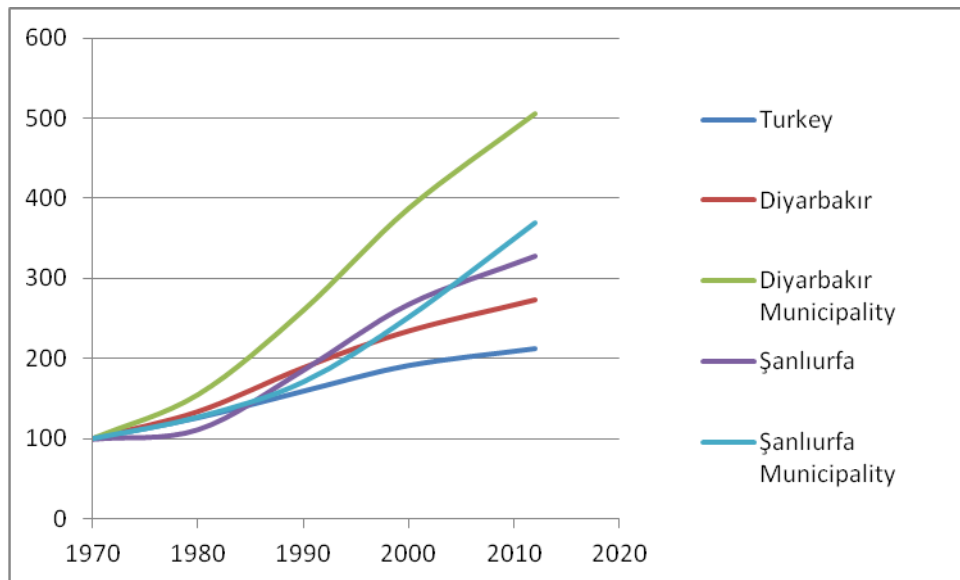
Graph 5- Population Growth in TRC2 Cities and Turkey, 1970-2012



Source: TURKSTAT, 2013.

Growth rate in Diyarbakır and Şanlıurfa between 1970-2012 is higher than national growth average as shown above. Graph 6 shows that the highest growth occurred in Diyarbakır central municipal area and the secondly highest growth took place in Şanlıurfa's municipal area in the same period.

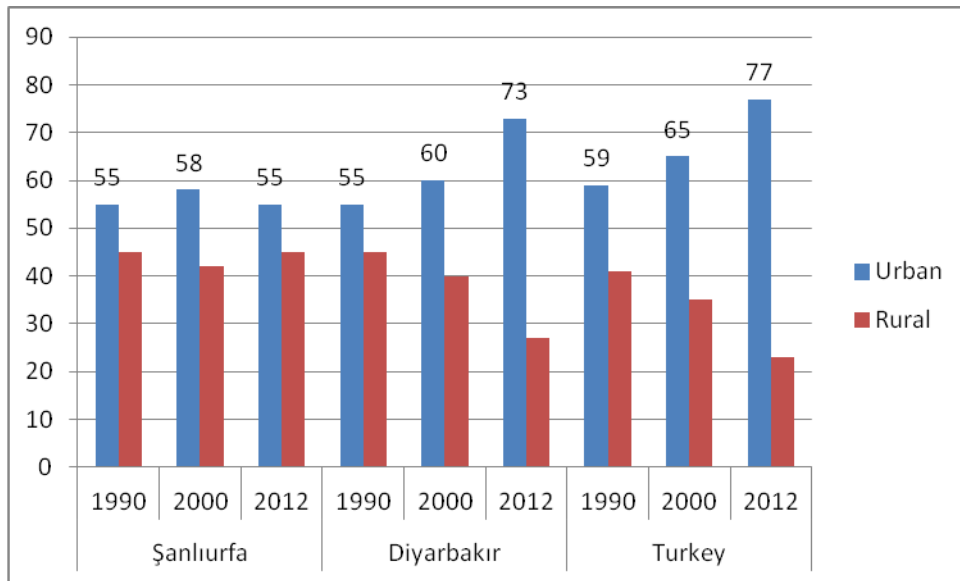
Graph 6- National, City and Urban Growth Rates Between 1970-2012



Source: TURKSTAT, 2013.

Urban population of Diyarbakır increased five-fold, urban size of Şanlıurfa's population also rose three-fold between 1970 and 2012.

Graph 7- Urbanization Rate in Şanlıurfa, Diyarbakır and Turkey.

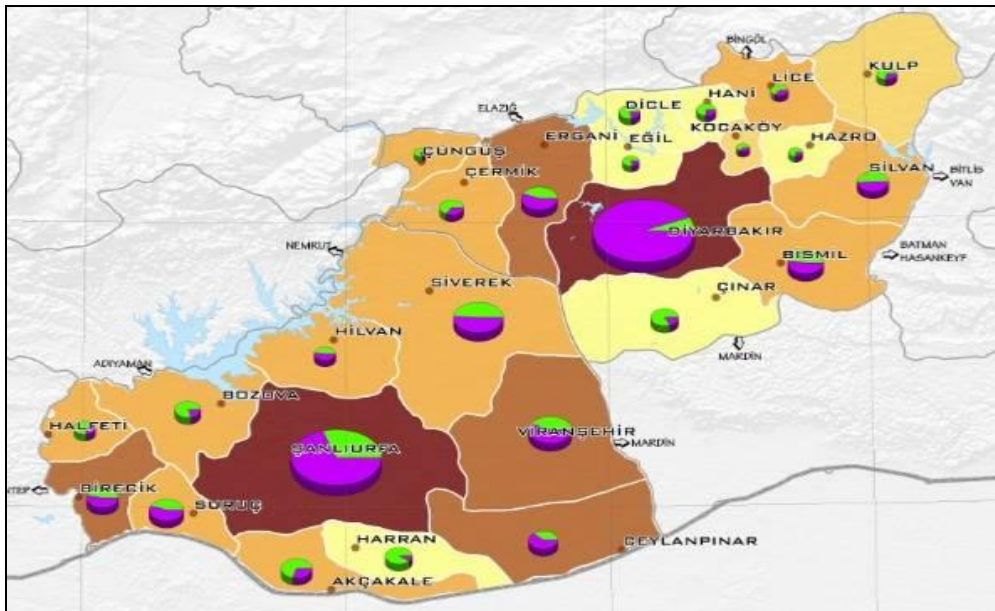


Source: TURKSTAT, 2013.

As a result of migration from rural areas shifted to urban Especially between 1990-2000, mainly Diyarbakır exposed to rapidly urbanization process.

Map 3 shows the urbanization rate is in line with the socio-economic development rank of districts in region. Districts located in the northern part of Diyarbakır relatively lag behind in terms of development and losing population with a significant proportion.

Map 3- Hierarchy Regarding Urban Size and Urbanization Rate of Districts²



² The color of the districts represents the socio-economic development rank from dark to light on the map.

All districts located in the north of Diyarbakir except Ergani, migrate to other districts or cities and getting smaller significant proportion of the population lives in loss. Ergani and Bismil district is constantly growing due to its wide agricultural land, central location on major roads and proximity to the Diyarbakır metropolitan area.

3.1 Rank-Size Distribution of Diyarbakır

Districts of Diyarbakir province in the period of 1970-2010 and changes of urban size in terms of population are listed below:

Table 3- City-Size Distribution and Change in Time

	1970	1980	1990	2000	2010
Diyarbakır *	581.208	778.150	1.094.996	1.362.708	1.528.958
Merkez	149.566	235.617	381.144	545983	843460
Silvan	18.592	43.624	59.865	64136	41451
Ergani	18.544	24.218	37365	47333	64608
Bismil	9.403	19.059	39834	61182	56887
Lice	8.093	9.798	11639	11927	9644
Çermik	6.910	8.298	16531	15843	17962
Kulp	6.346	8.077	7472	15825	10119
Hani	5.500	6.115	10266	10918	8146
Hazro	4.321	5.729	8048	6189	4488
Dicle	4.245	5.619	5414	9861	8436
Çınar	3.823	4.426	10080	13282	11666
Çüngüş	3.161	3.684	3.935	4708	2495
Eğil			4.803	4827	5046
Kocaköy			4.244	5678	5764

Source: TURKSTAT, 2012.

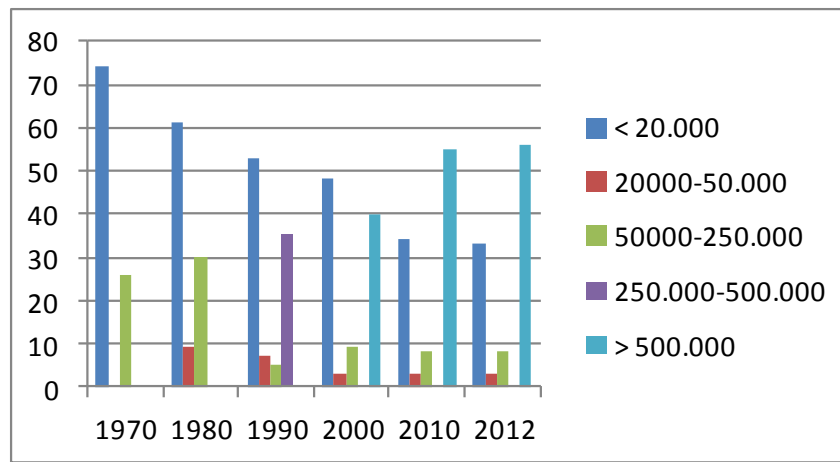
* The figures in the first row are provincial population.

Table 4 shows the data related to distribution of city sizes during 1970-2010. In the period the regional population growth rate occurred above the national average rate due to the high fertility rate and in particular effect of migration rate from rural and peripheral areas to cities. For example provincial population of Diyarbakır has tripled and urban population increased about 6 times. At the same period small settlements lost population hence their share in the overall distribution decreased. These figures show that there is migration from small settlements to larger centers.

Table 4.- Percentage Distribution of Population in Cities

	< 20.000	20000-50.000	50000-250.000	250.000-500.000	500.000-750.000	>750000
1970	74	0	26			
1980	61	9	30			
1990	53	7	5	35		
2000	48	3	9		40	
2010	34	3	8			55

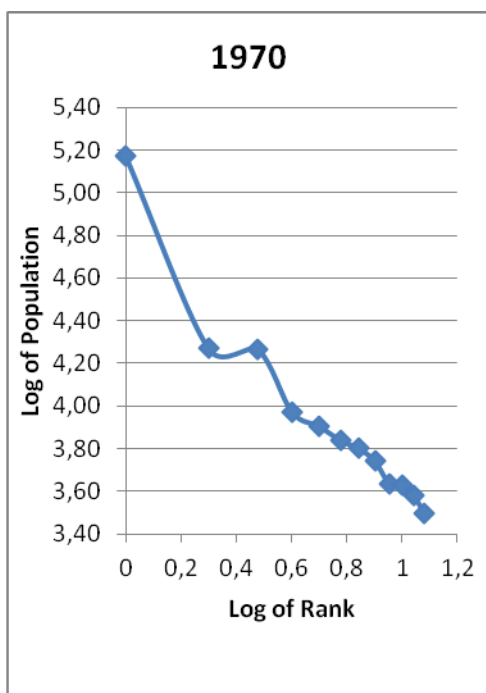
Source: TURKSTAT, 2012.

Graph 8.- Change in City Size of Diyarbakır Between 1970-2012 (%)

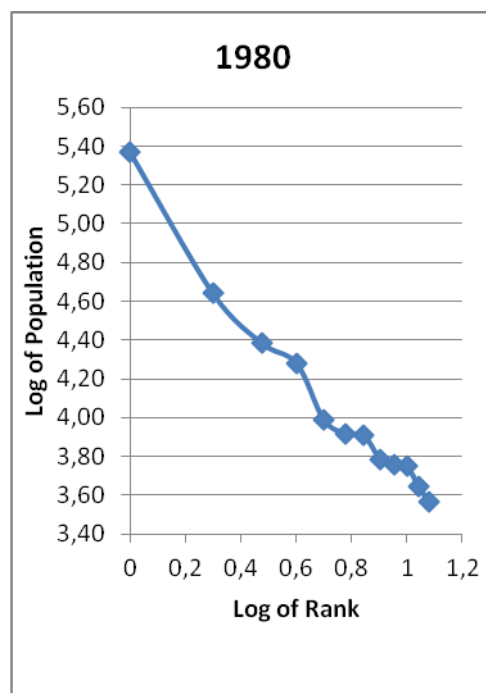
Source: TURKSTAT, 2013.

As shown table 5 above; share of the population in the small settlements in the province is diminishing quickly and the population of the city of Diyarbakır has increased rapidly. In this period, Diyarbakır got mass migration from in and around the region due to increase in disparities between eastern and western regions, effect of driving the migration from rural areas and terrorism and security issues in the Southeastern Anatolia. Then Diyarbakır was unable to keep this migration within the region due to unemployment and migrate to the metropolitan cities of Turkey. It is seen that the migration rate is reduced in recent years.

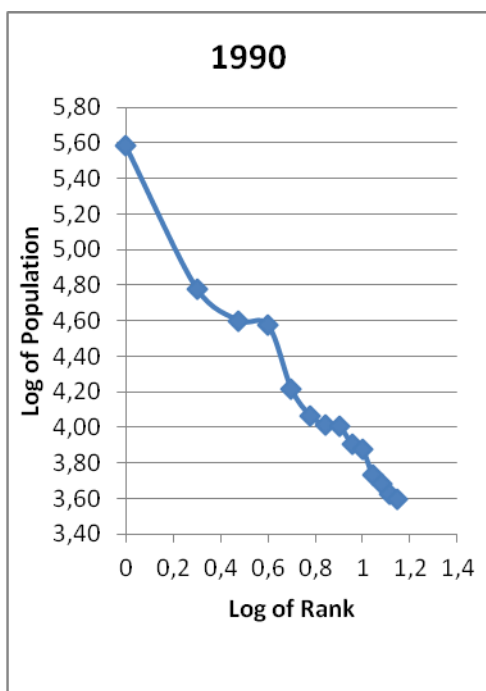
During 1970-2010 period; the *rank size rule was applied to cities in Diyarbakır* and rank size distribution of the cities determined by using *Zipf's law* as shown below:



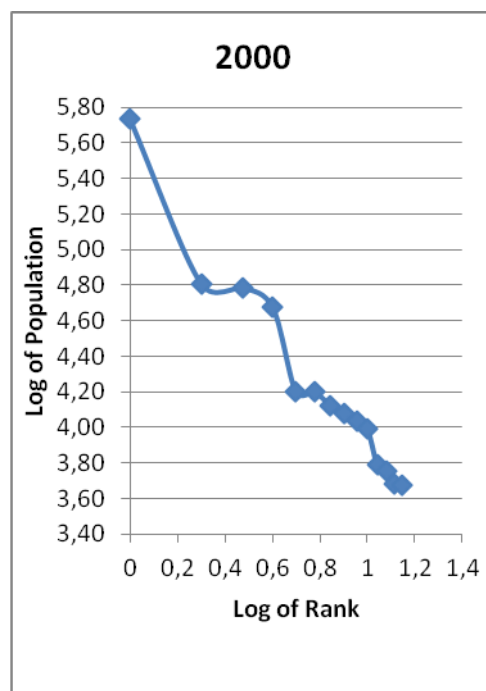
Graph 9- Rank-Size Distribution in 1970



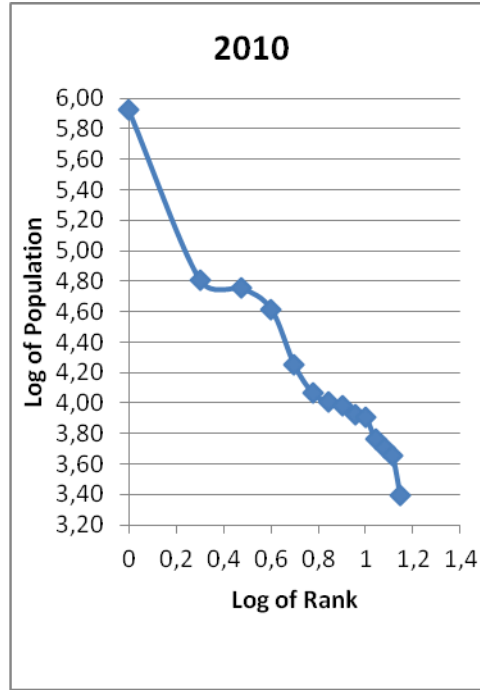
Graph 10- Rank-Size Distribution in 1980



Graph 11- Rank-Size Distribution in 1990



Graph 12- Rank-Size Distribution in 2000



Graph 13.- Rank-Size Distribution in 2010

Figure 3 shows that, when Diyarbakir is seen the only major city (primate city) in 1970 the slope of the linear distribution of cities is *"-1,6"* (where *"1"* reflects the excellent balanced rank size). When migration from rural to urban increased between 1980-2000, it is seen that slope of the linear distribution increased, the population share of small settlements decreased and medium-sized cities getting migration grew. As growing medium-sized cities Ergani and Bismil districts got migration in this process due to opportunities in agriculture. Silvan was the largest district of Diyarbakır in 1970's, 1980's and 1990's, but after 1990 it began to shrink because of the security issues, terrorism and change of highway route in 1990s. Since 2000 population have tend to cluster in Diyarbakır city center, so that Diyarbakır's primate city feature became more apparent. In brief, between 1970-2010, share of the small towns and settlements in the overall distribution decreased and slope of rank-size distribution curve reached to *"-2,2"* from *"-1,6"* which is relatively close to ideal distribution value.

3.2 Rank-Size Distribution of Şanlıurfa

Urban settlements of Şanlıurfa province in the period of 1970-2010 and changes of urban size in terms of population are listed below:

Table 5- City-Size Distribution and Change in Time

	1970	1980	1990	2000	2010
Şanlıurfa *	538.131	602.736	1.001.455	1.443.422	1.663.371
Merkez	100.654	147.488	276.528	385.588	498.111
Siverek	34.146	29464	63.049	126.820	111.628
Birecik	18.392	20081	28440	40.054	47792
Viranşehir	17.850	40820	57461	121.382	90784
Suruç	15.033	18892	39905	44.421	55600
Akçakale	6.096	11184	15211	32.114	25793
Hilvan	5.185	5635	14152	16.094	21518
Bozova	4.853	5597	16745	19.848	11.917
Halfeti	3.315	3258	4128	2.766	8.457
Harran			2267	8.784	6.213

Source: TURKSTAT, 2012.

* The figures in the first row represent provincial population.

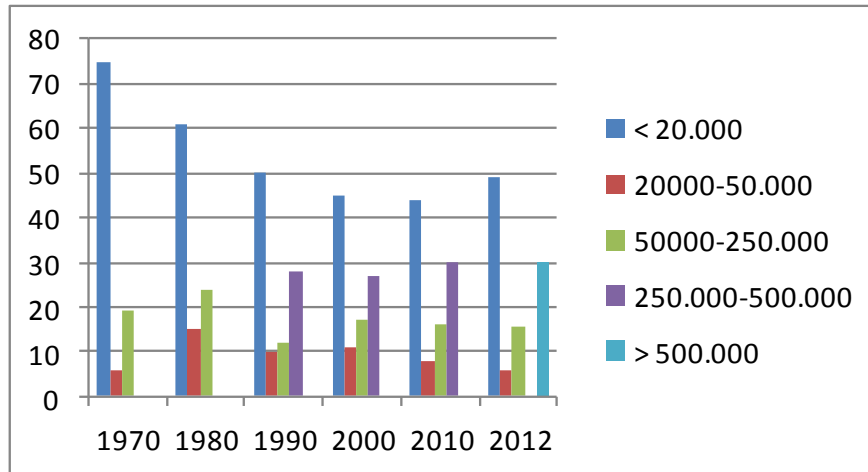
With more scattered population, Şanlıurfa province has high rural population rate. In the period of 1970-2010 the provincial population growth rate occurred above the national average rate due to the high fertility rate and migration from rural and peripheral areas to cities.

Table 6- Percentage Distribution of Population in Cities

	< 20.000	20000-50.000	50000-250.000	250.000-500.000
1970	75	6	19	
1980	61	15	24	
1990	50	10	12	28
2000	45	11	17	27
2010	44	8	16	30

Source: TURKSTAT, 2012.

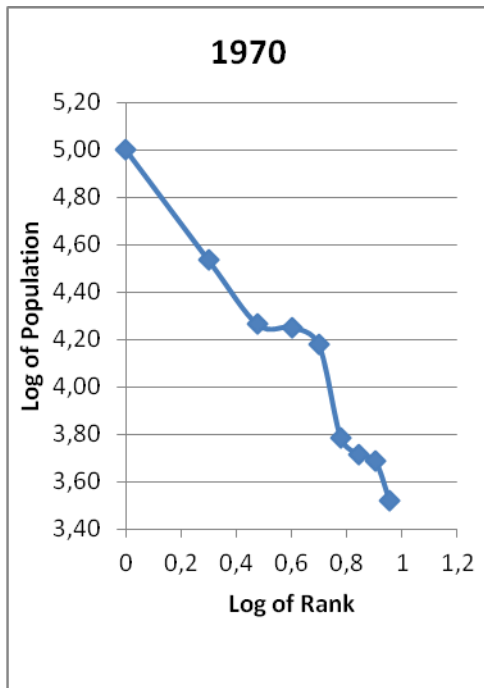
Graph 14- Change in City Size of Şanlıurfa Between 1970-2012 (%)



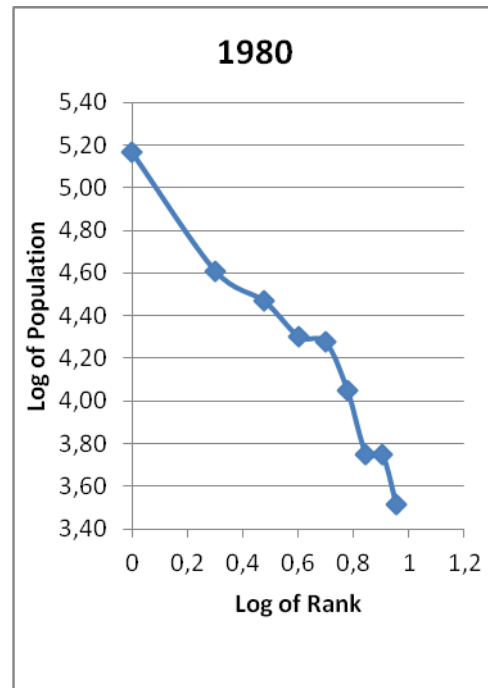
Source: TURKSTAT, 2012.

The figures above show that whereas population share of small settlements decreased, while both number and share of medium-sized cities increased in 1970-2010 period. It can be said that growth occurs in different levels of settlements.

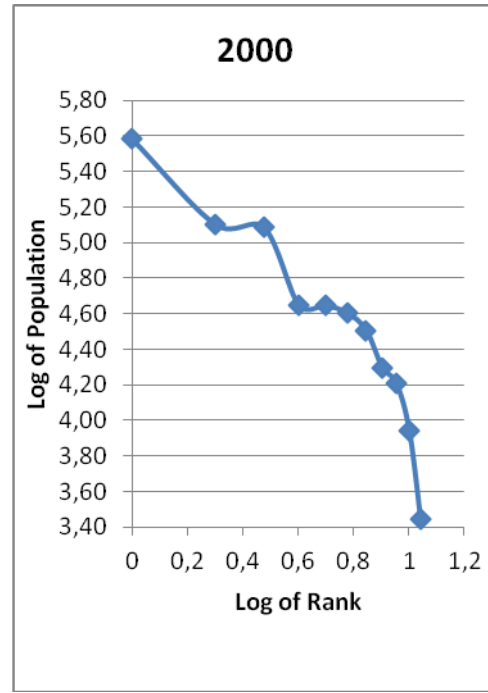
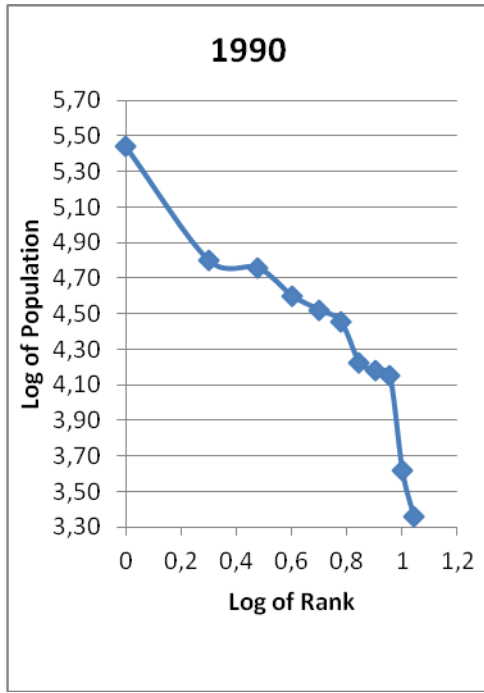
During 1970-2010 period; the *rank size rule was applied to cities in Şanlıurfa* and rank size distribution of the cities determined by using *Zipf's law* as shown below:



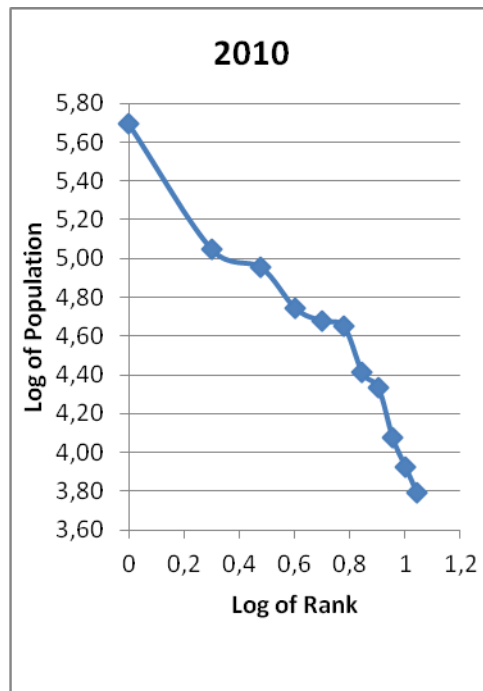
Graph 15- Rank-Size Distribution in 1970



Graph 16- Rank-Size Distribution in 1980



Graph 17.- Rank-Size Distribution in 1990 **Graph 18.-** Rank-Size Distribution in 2000



Graph 19.- Rank-Size Distribution in 2010

It can be seen on graph 15 that where Şanlıurfa is seen as a primate city, slope of the linear distribution of cities is "- 1,6" and close to ideal distribution. Despite high migration rate in region during 1970-2010, there is no significant change in slope of the distribution line

(-1,8). In the massive immigration period during 1980-2000 it can be said that the rank size balance deteriorated, slope of the linear reached -2,1 in this period, but after 2000 slope of the line decreased. As a basic consequence of the infrastructure and agricultural investments in terms of South East Anatolian Project, Şanlıurfa central city and some large districts attract the labor force from periphery. According to the rank-size distribution of Şanlıurfa, there is a polycentric growth in the city, migration continued from rural settlements, whereas the population of the city grows in general.

4. Conclusion

Migration as a basic consequence of regional disparities has been a problem for Turkey since the 1950s. TRC2 NUTS-2 Region, consisting Diyarbakır and Şanlıurfa, is among those which face this problem the most deeply due to get immigration from its own region and migration to the west region of Turkey. However, in the cities, employment in manufacturing industry is low and employment opportunities are insufficient for increasing population. Whereas Diyarbakır and Şanlıurfa are identified as regional growth centers by national policies in order to trigger development of underdeveloped region and keep migration within the region.

The rank-size distribution of settlements and city-size were examined in the period of 1970-2010 both for Turkey, Diyarbakır and Şanlıurfa provinces in this study. In Turkey's urbanization process, as well as the major metropolitan cities which get migration, two groups of cities are known to grew rapidly; the first group is industrialized medium-sized cities and the second group is fast growing settlements subjected to high migration mainly Diyarbakır and Şanlıurfa. In this period mass migration occurred in the region due to increase in regional disparities, also effect of migration waves from rural areas and terrorism and security issues in the Southeastern Anatolia Region. According to results of the study; rank-size distribution of the region was close to the ideal distribution on 1970, but changed after especially 1990 due to waves of migration and slope of the curve increased. Diyarbakır seems to be a primate city and tends to increase its role in system in this period. As for Şanlıurfa it can be said that the central city and medium-sized cities have grown up together. Also migration continued from small and rural settlements, whereas the population of the region grew in general as well.

Results shows that there are big differences related to city-size in Diyarbakır-Şanlıurfa region because of high intraregional disparities. Besides of this, rank-size distribution of the region represents primate cities which attract more investment across the region. In order to create a well balanced settlement system and ensure healthy urbanization in the region; increasing employment opportunities, ensuring social integration and adequate physical infrastructure policies are crucial for regional centers and medium-sized settlements that serve as sub-regional areas. And measures should be taken to improve the quality of life in small and rural settlements.

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