AN ASSESMENT OF THE EFFECT OF HIGHWAYS ON THE ECONOMIC PERFORMANCE OF THE REGIONS IN TÜRKİYE

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ABSTRACT

In the contemporary landscape, public investments in infrastructure stand out as the most impactful catalyst for enticing private sector engagements in various regions across the globe. Particularly, transportation infrastructure emerges as the primary focal point for investment, playing a pivotal role in stimulating inter-regional competition by facilitating easier market access. Research on this subject affirms that a well-developed transportation infrastructure significantly contributes to regional development, fostering increased production. The augmentation of transportation infrastructure not only attracts fresh investments but also generates employment opportunities, thereby fostering economic growth. Türkiye, recognizing the significance of this correlation, has intensified its efforts by bolstering investments and implementing innovative financing mechanisms for transportation projects. This study aims to analyse the impact of Türkiye's transportation investments between 2008 and 2017 on regional economic performance. The evaluation will explore whether these investments contribute directly to the economic performance of the regions. To achieve this, the study draws insights from existing literature that underscores the role of transportation in regional development, referencing pertinent studies conducted globally and within Türkiye. Subsequently, data sourced from authoritative institutions such as the General Directorate of Highways, Social Security Institution, and Development Agency are subjected to both quantitative and qualitative analysis methods. This comprehensive approach ensures a thorough examination of the multifaceted aspects of the relationship between transportation investments and economic performance.

Keywords: Highway infrastructure; Türkiye; Shift-share analysis; Regional development.

INTRODUCTION

Production activities are influenced by many internal and external factors such as proximity to raw materials, geographical advantages and advanced regional infrastructure for choose to place (Capello, 2009). Public investments in the region increase the attractiveness because of the private sector makes the investment. As a result, the economic development process of the region accelerates (Deng, 2013). The effects of infrastructure investments on economic development and how they will be measured are the subjects that have been discussed for years (Bröcker & Rietveld, 2010). The most prominent issue in this discussion is the transport infrastructure and the policies produced in this issue. The development of new markets, the increase in competition in the markets, the effect of transportation costs on production activities have increased the importance of transportation infrastructure (Holl, 2004). While important policies have been produced all over the worlds in terms of transportation infrastructure, investments in transportation have increased and new investment models have started to be developed in our country. Made about Türkiye, studies using different methods and different data, transportation has reached the conclusion that positively effect on economic development (Kara & Ciğerlioğlu, 2018). The main objective of this paper is to understand regional analysis methods and to use these methods in regional dynamics or subjects. While using these methods, the impact of the highways which are important and national projects for the country will be evaluated. In doing so, first of all the effects of infrastructure investments on regional development investigated from the literature. In particular, the effects of transport infrastructure have been examined. Later, some made in the world on the effects of transport infrastructure in Türkiye and studies and the results were compiled. In the data and methodology section, the construction year of the highways designed by the General Directorate of Highways were determined and their areas of influence were selected. To determine the effects of these roads on the region, the labor force data produced by the Social Security Institution were analysed. All roads in the country are not included in the analysis due to limited labor force data. The impact of highways on regional development has been handled only between 2008-2017 on the labor force data of the manufacturing sector. Then, regional data were analysed by quantitative and qualitative methods. It was determined that only numerical data would not be able to interpret the result correctly and the current situation analyses of the regions in the years when the road was made were also examined. Relative Specialization Index (RZI), Relative Diversity Index (RDI), Shift-Share Analysis methods and Development Agency reports were used for this

analysis. Finally, as a result of regional analyses, the economic performances of the regions in the highways were interpreted. During this interpretation, questions such as how the economic performance of the regions where the road passes have changed, whether the highways have a direct or indirect effect on regional development have been answered. As a result of the study, it was determined that the highways had an indirect effect on regional development. The economic performance of the regions showed different dynamics for different geographical regions and no direct impact of the highway could be determined. Development Agency reports supported this indirect effect and the regions have different dynamics outside the highways.

1. THE EFFECT OF TRANSPORTATION INFRASTRUCTURE ON REGIONAL DEVELOPMENT

In the spatial areas where production activities take place, firms and actors select locations according to certain criteria and allocate regions according to regional development and welfare level. In addition to the distribution of production resources in the space, also the commercial products produced are displace within the space and distributed to the appropriate markets. While the economic system completes the production cycle, it is affected by location, geographic factors, availability of raw materials, speed of resources and product flow. Raw material and geographic advantages in space are determined only by external factors, but also by internal factors such as accessibility and spatial development. Depending on this cycle, investments are concentrated in some regions are inadequate in some regions (Capello, 2009). Regional development is the result of the investment policies of the actors and the public. Investments in the public sector increase the capital by attracting private capital to the region and encourage the sector for more private investment. The distribution criteria of economic production in the region include the development and policies of public infrastructure investments such as transportation and communication (Deng, 2013).

The effects of infrastructure investments on the public and the public sector's service provision have been discussed especially since the analysis of the infrastructure and productivity relationship by Aschauer (1989). According to the study, Aschauer (1989) stated that there is a positive relationship between the infrastructure investments and productivity and economic growth. In order to increase the economic growth, Aschauer (1989) emphasized that the important decisions of the government in public investments should be increased especially in highway and sewerage systems. This study also initiated political debates on the

analysis of the contribution of infrastructure to productivity and development. The uncertainty of the long-term predictability of the change in the economic structure affected by the infrastructure and the uncertainty of the parameters to be used to analyse the effects of infrastructure projects have also increased the debate on this issue (Bröcker & Rietveld, 2010). Then, with the use of employment growth and productivity change to analyse the relationship between production and public investments, comprehensive analyses in the literature and results proving the relationship between infrastructure and economic development were produced (Gramlich, 1994).

Infrastructure investments are generally defined as telephones and telephone lines, power lines, roads and railways (Bröcker & Rietveld, 2010). However, especially in the last 30 years, the transportation infrastructure, the policies produced about transportation and the relationship between economic development have started to gain importance in Europe. With the new economic geography, transportation costs, competition, market size, location of production are directly related to transportation infrastructure (Holl, 2004). Deng (2013) states that existing discourses on road construction bring prosperity and influence countries' policies and encourage countries to invest in the development of a transport network. It is argued that the investments made with the developing policies will bring economic growth by increasing the efficiency. The transport infrastructure has a significant impact on the distribution of economic activities as it provides integration with the market and regional competition. Better transport links provide better access to the market, better product flow and better relations between regions, and studies show a positive relationship between transport infrastructure and economic growth (Holl, 2004). In areas where there is insufficient transportation infrastructure, material transportation and mobility of labor force will be limited and this situation will negatively affect the economic performance of the region. Where transportation infrastructure develops, transport costs and input costs are reduced due to easy access. This situation increases the investments in the region to create new employment branches. Thus, the economic performance of the region can change with the development of the infrastructure (Deng, 2013). This change is supported by the development of the region's productivity and competitive structure (Maciulis, Vasiliauskas and Jakubauskas, 2009).
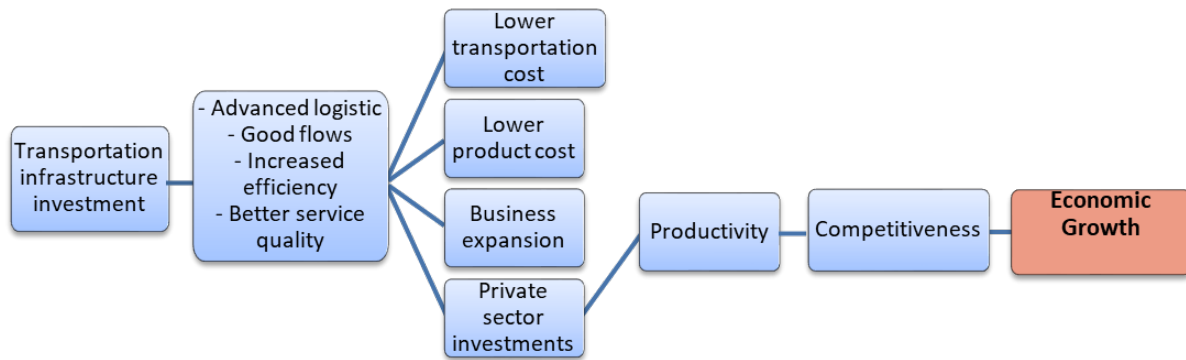
Figure 1.1: The impact of transportation on Economic Growth adapted from (Maciulis, Vasiliauskas and Jakubauskas, 2009).

As seen in Table 1.1, in the development scenario created directly and indirectly by transportation, the existence of the transportation system is at the center of an economic development where every segment of society can benefit. In developing countries, transportation infrastructure plays an important role in the elimination of development differences between rural and urban and in the development of rural areas (Maciulis et al., 2009). However, with the globalization of goods flow and capital very rapidly displaced with the abolition of trade barriers, the transportation infrastructure has had an international importance and has started to affect the international competitiveness of global cities (Banister & Berechman, 2001). With the networks provided by the transportation, the regions had the opportunity to participate in the global economy. The effect of transportation on economic activities is spread by spatial connections and ensures the continuity of mobility (Deng, 2013). The manufacturing sector, which needs flow and product - market relations, is most affected by this mobility (Holl, 2004). As the transportation costs in the sector increase, the competitiveness and production power of the region is decreasing. Significant increases in transport costs prevent regional growth. Reducing costs directly supports economic development by increasing per capita income (Maciulis et al., 2009).

Table 1.1: Transportation infrastructure investmtent effect adapted from (anister, Thurstain and Goodwin, 2011).

In Local Economy	Production and productivity (macro level)
	Agglomeration economies and labor market effects (at meso level)
	Land and property market effects (micro level)
In Global Economy	Global competition
	Global goods flow
	Adding to global networks

2. THE EFFECT OF TRANSPORTATION INFRASTRUCTURE ON REGIONAL DEVELOPMENT IN THE WORLD AND TÜRKİYE

Considering the advanced transportation investments in the world, it can be said that highways have a more prestigious place besides other transportation infrastructures. Large investments are being made in the road network presented as proof of a country's level of development. Road network in terms of transport infrastructure and quality the most developed countries in the world are the United States, Germany and the United Kingdom (Kögmen, 2014).

A large number of studies have been published in the literature analyzing the effects of transportation infrastructure on regional development. Aschauer (1989), with his work has been a pioneer in this issue. Aschauer (1989) who tested the relationship between infrastructure and productivity concluded that there was a positive relationship between the two. Hong, Chu and Wang (2011) examined the impact of transportation infrastructure on economic growth in China and concluded that transportation has a positive impact on economic growth over a period of 20 years. Lall (2007) conducted similar studies in India and found positive effects for the 15-year analysis process. As a result of these studies, it can be said that infrastructure investments support regional development and the policies to be produced in this direction will increase the level of development of countries.

Transport infrastructure in Türkiye is built on the establishment of the relationship between urban and rural areas. It is aimed to realize the regional development with the transportation projects implemented at the places where the infrastructure is insufficient. With the development of technology, strengthening of international networks and the convergence of cities on a global scale facilitated the flow of goods and people. In order to meet this need, investments in new transportation projects have been increased in our country. (Kalaycıoğlu, 2008). The nature of the country with a strategy document for Türkiye 10. Development Plan in scale; Developing transport infrastructure to increase accessibility, reduce costs, and design healthy and reliable living environments is one of the basic tools of urban infrastructure. The country's most important strategy document also emphasized the transport infrastructure for development at regional level (Ministry of Development, 2013). The transportation infrastructure investments made in this direction are carried out by the General Directorate of Highways under the Ministry of Transport. Especially after 2010, with the changing policies, large-scale infrastructure projects started to be implemented with build-operate-transfer model.

Kara and Ciğerlioğlu (2018) examined the effects of regional economic developments of land transport infrastructure in Türkiye. In their analysis, the long-term transport infrastructure has concluded that the positive impact on economic development. Similar studies conducted in Türkiye and the world, different methods have shown similar results in a range of different regions and different years. This situation can also be concluded discussion related to this subject.

3. DATA AND METHODOLOGY

First of all, the highways that the General Directorate of Highways has put into service and continued construction are determined. According to the years of construction of these highways, the impact area has been determined to analyse the impact of transportation on regional development. Then the labor force data collected by the Social Security Institution were analysed to measure the economic performance of these regions.
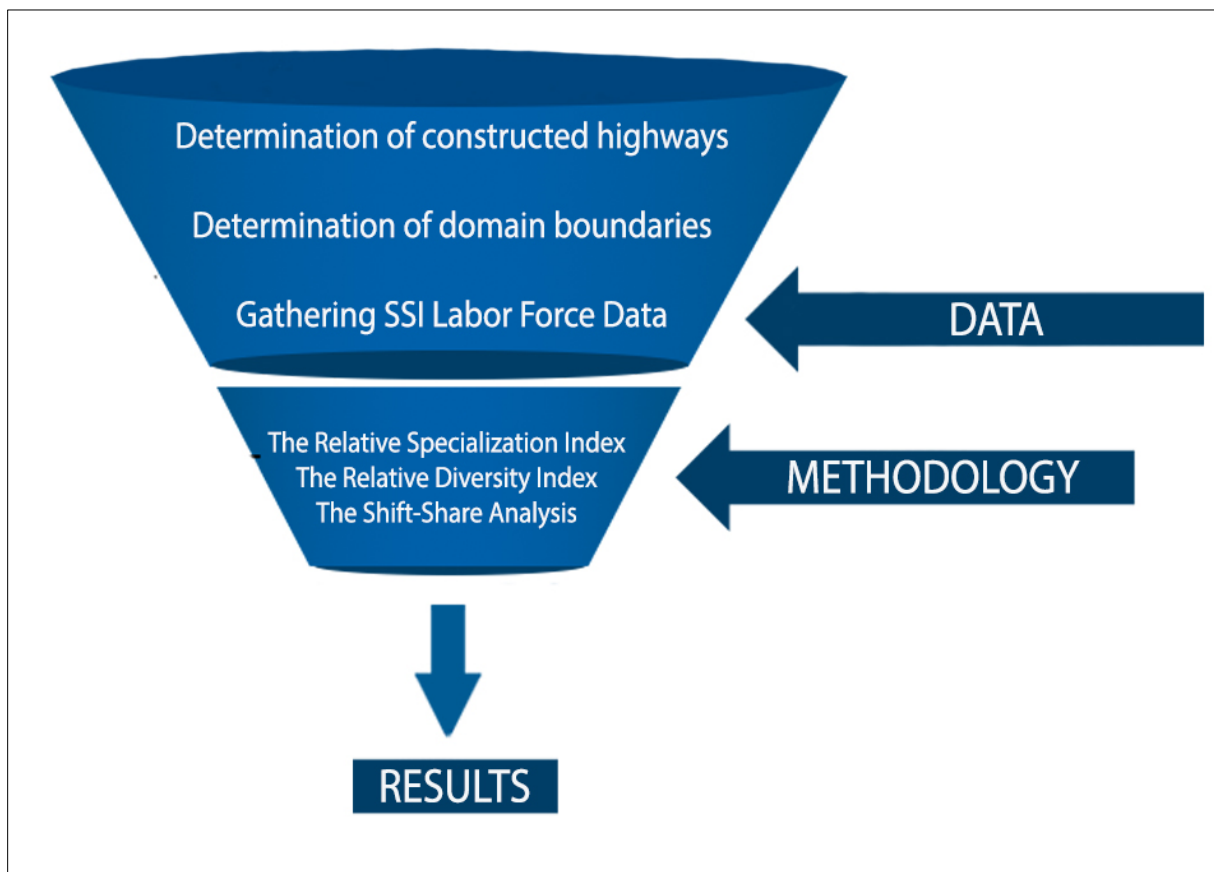

Figure 3.1: Research method diagram

Secondly, quantitative research methods are used as the research method and consistency with qualitative data analysis is provided. For the quantitative research, regional analysis methods were used in two stages. In the first phase, the "Relative Specialization Index" (RZI) and the

"Relative Diversity Index" (RDI) to understand sectoral specialization and diversification; In the second phase, the Shift-Share Analysis was used to explore the increase in labor force and the advantages of the regions. These 3 different methods are used to interpret the economic performance of the regions with the construction of the highways. As a qualitative data analysis method, sectoral change is examined from development agency reports according to year and area where highway is built. The reason for this is that the data of the quantitative research methods are not sufficient, and they are not completely explanatory.

Finally, as a result of the collected data and analyses, the economic performance analyses of the highways are interpreted in order to discuss and evaluate the regional effect of the highways according to quantitative research methods.

3.1. Data

First, to detect highways in Türkiye this article, in 2019 highway map prepared by the General Directorate of Highways (KGM) is used. As shown in Figure 3.2, the highway projects on the map and highways open to service are indicated. According to this map, only the highways which are open to service are taken into consideration to understand the effect of highways on regional development. The reason why the construction of ongoing highway projects is not included in this research is that micro-data cannot be reached economically and geographically in the areas where these highways are located. Only O-21 Nigde-Tarsus Highway, O-31 Izmir-Aydın Highway and O-52 Gaziantep-Şanlıurfa Highway were selected from the highways whose construction were completed and open to service. The reason for the selection of these highways is that there is no access to qualitative and quantitative data on the dates of other highways. These data are very important in terms of the economic performance analysis before and after the highway construction.
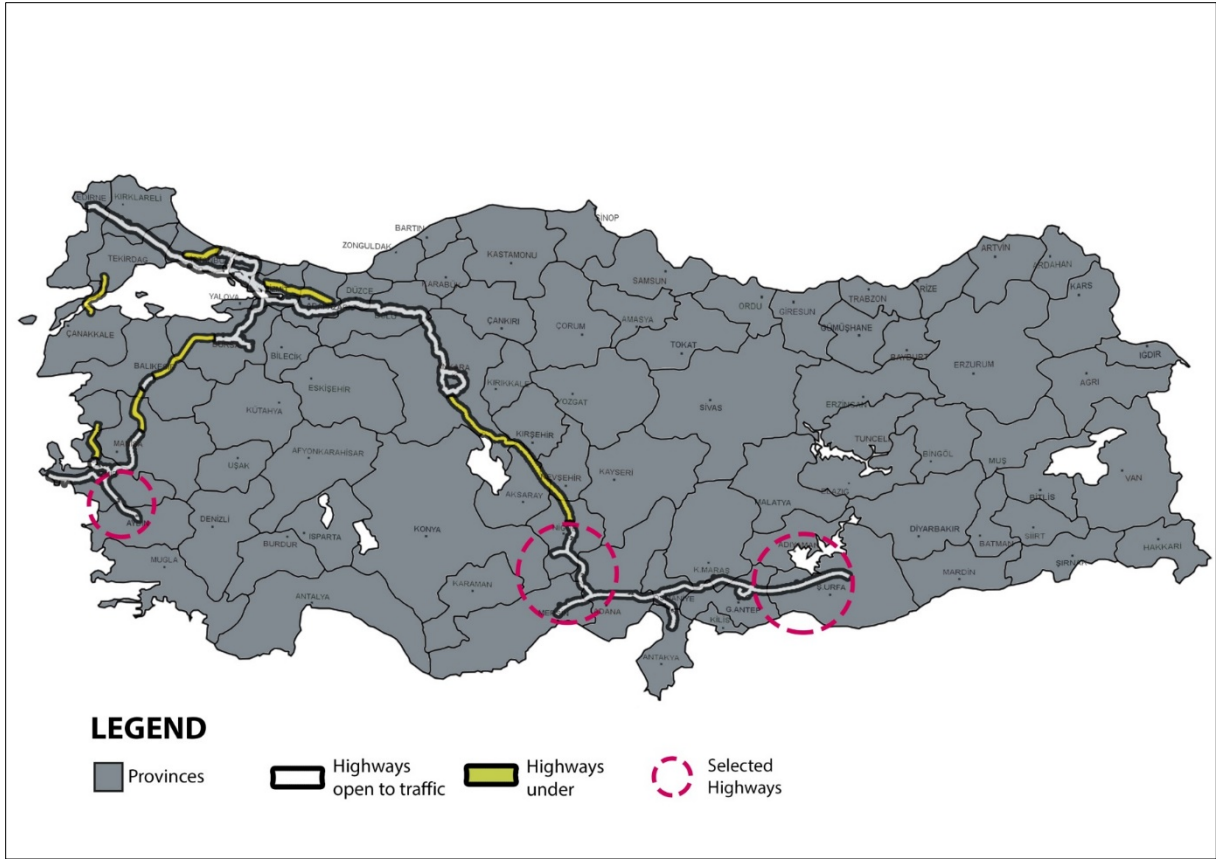
Figure 2.2: Highways in Türkiye

As shown in Figure 3.2, the selected highways are located in three different regions: Aegean, Mediterranean and Southeastern Anatolia. Therefore, in this article, the economic performance effect of highways according to geographical regions can be understood. The O-31 Highway in the Aegean Region that connecting the Izmir-Aydın provinces was constructed in 2010, the O-21 Highway in the Mediterranean Region that connecting the Adana-Mersin-Niğde provinces was constructed in 2012, the O-52 Highway in the Southeast Anatolia Region that connecting the Gaziantep-Şanlıurfa provinces was constructed in 2009.

In order to measure the impact of these selected highways on regional development, the Nomenclature of Units for Territorial Statistics 3 level were used as administrative and functional classes. As seen in Figure 3.3, the cities where highways pass through are determined as İzmir, Aydın, Adana, Mersin, Niğde, Gaziantep and Şanlıurfa.
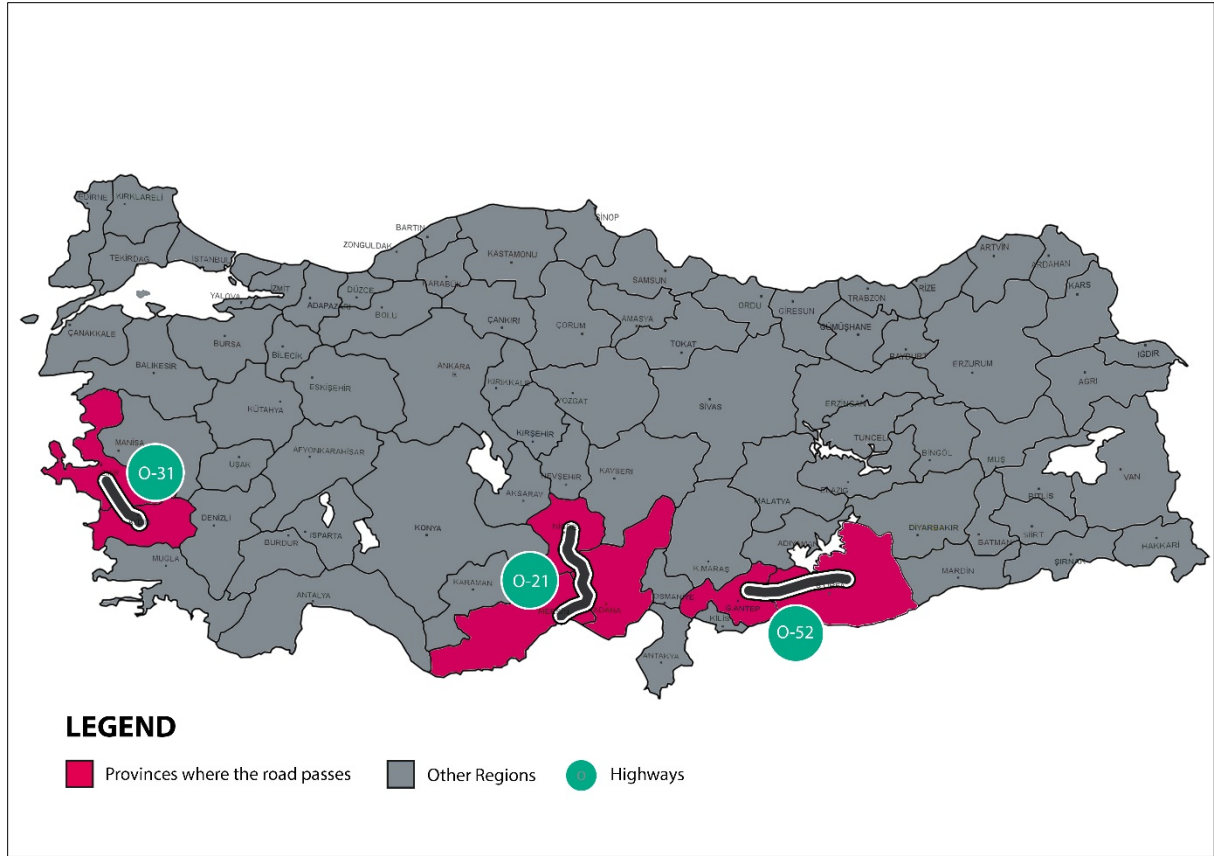
Figure 3.3: Selected highways and its provinces

Finally, labor force data of level 3 regions were taken between 2008-2017 by the Social Security Institution to analyse the impact of roads and regional performance of provinces. Manufacturing data were used in these data. The reason for the use of the manufacturing sector is the close relationship between transportation infrastructure and the manufacturing sector as mentioned in the literature section. The transportation provides the link between economic centers and this connection attracts new production centers to the regions. Therefore, the change in the manufacturing sector has been analysed in order to understand the impact of transportation on the regions and the economic performance of the regions. The labor force data of the manufacturing sectors given in the table used in regional analysis methods.

Table 3.1: NACE REV. 2 Manufacturing Sector codes

10 Manufacture of food products
11 Manufacture of beverages
12 Manufacture of tobacco products
13 Manufacture of textiles
14 Manufacture of wearing apparel
15 Manufacture of leather and related products
16 Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
17 Manufacture of paper and paper products
18 Printing and reproduction of recorded media
19 Manufacture of coke and refined petroleum products
20 Manufacture of chemicals and chemical products
21 Manufacture of basic pharmaceutical products and pharmaceutical preparations
22 Manufacture of rubber and plastic products
23 Manufacture of other non-metallic mineral products
24 Manufacture of basic metals
25 Manufacture of fabricated metal products, except machinery and equipment
26 Manufacture of computer, electronic and optical products
27 Manufacture of electrical equipment
28 Manufacture of machinery and equipment n. e. c.
29 Manufacture of motor vehicles, trailers and semi-trailers
30 Manufacture of other transport equipment
31 Manufacture of furniture
32 Other manufacturing
33 Repair and installation of machinery and equipment

With these data, the Development Agency reports of the regions where the provinces were located were examined in order to understand the changes in the sectoral and economic performance according to the provinces and the independent socio-economic dynamics. This qualitative data collection method is carried out to ensure that the results of the quantitative analysis and the effects of the highways on regional development are consistent and reliable.

3.2. Research Methodology

Quantitative research methods were used in the research methodology. In order to understand the effects of the highways on the provinces mentioned in the first phase, specialization and diversification measurements were made by manufacturing sector data.

First, in order to calculate the sectoral diversification which represents the differences in sectoral employment shares at the national level, the "Relative Diversity Index" (RDI) as practiced by Duranton and Puga (2000) is used. The Relative Diversity Index (RDI) which can be describe as:

$$RDI_i = 1/\sum_j |s_{ij} - s_j|$$

RDI is the relative diversity index of the region r, Sij represents the share of industry j in region i, and Sj represents the share of industry j in the national employment. For an individual region, RDI indicates the inverse of the summed differences between each regional and national industrial share. The value of the RDI increases as the regional employment distribution approaches that of the national economy. In this research, the data for RDI is used for all years from 2008-2017.

Second, to define how specialized a region is in an industry correlative to its nation, the "Relative Specialization Index" (RZI) as practiced by Duranton and Puga (2000) is used. The Relative Specialization Index can be explained as:

$$RZI_i = \underset{j}{\text{Max}}\ (sij/sj)$$

RZI which is a region's specialisation in a given sector is to divide the share of each sector in local employment by its share in national employment. In this research, the data for RZI is used for all years from 2008-2017.

In the second stage, shift-share analysis method which is used to discover employment change and the benefits and harms of the regions for manufacturing sector is used to analyse the economic performance of the provinces according to the date of the road construction. Shift-Share analysis according to Haynes (1997); It is a method used to analyse the employment and sectoral development of the region in order to evaluate the impact of regional policies focused on employment and economic growth of the region. Marguez et al. (2009) sees Shift-Share analysis as a traditional tool to perform sectoral performance, interregional comparison, measurement and evaluation within a given time frame in a region. Shift-Share analysis divides regional growth into three components: National Share (NS), Industrial Mix (IM) and Regional Shift (RS), and can be expressed as follows:

Actual Growth = National Share (NS) + Industrial Mix (IM) + Regional Shift (RS)

NSi ≡ ei, t-1 (Et / Et-1)

IMi ≡ ei, t-1 (Ei, t / Ei, t-1 - Et / Et-1)

RSi ≡ ei, t-1 (ei, t / ei, t-1 - Ei, t / Ei, t-1)

ei = regional employment in the i sector   *Ei = National employment in the i sector*

e = total employment in the region   *E = national total employment*

t-1 = start year of term   *t = end year of term*

National Share (NS) component; is the increase in employment when the sectoral growth rate is assumed to be equal to national growth rate (Hirsch, 1973). Industrial Mix (IM) component connects the sectoral employment growth to a growth rate that is different from the total national average growth rate of that sector (Hirsch, 1973).

This component reflects the degree of specialization of fast-growing or slow-growing sectors at the national level in the region. The Regional Shift (RS) component measures the regional change due to the difference between the sector's growth rate in the region and the national growth rate of the sector (Hirsch, 1973). This component connects the sectoral growth in the region to its competitive advantage in the region. The main purpose of this analysis method is to emphasize the region-specific part of the increase or fall in a sector in the region. Therefore, the regional change (RS) component is seen as the most important component of the method.

Finally, the development agency reports in the regions where the provinces are located, together with the sub-sectors of the manufacturing sector, have been examined in order to avoid imbalances and inconsistencies in the analysis results before and after the year the highways were built. The economic and sectoral data gathered from these reports provide an opportunity to analyse the effects of various socio-economic variables on employment and economic performance changes except for the effect of transportation on regional development.

3.3. Result and Evaluation

In this section, evaluations based on collected data and analysis are explained in three stages for each highway respectively. First, the interpretation of specialization and diversification data, second, the evaluation of shift-share analysis and finally the qualitative support of these analysis methods were expressed separately for O-21 Adana-Mersin-Nigde Highway, O-31 Izmir-Aydın Highway and O-52 Gaziantep-Şanlıurfa Highway respectively.

3.3.1. O-21 Adana-Mersin-Niğde Highway

Table 2.2: The Relative Diversity Index Values for O-21 Highway Provinces

RDI	2008	2012	2017
Adana	9.099849	10.80764	14.18011
Mersin	8.563812	7.378766	9.324538
Niğde	4.492125	7.212462	7.512467

According to the analysis of the RDI in the manufacturing sector, the diversity in the manufacturing sector has increased since 2008 in all provinces where the O-21 Highway passes. Especially in Adana and Niğde, the rate of change is high. The increase in diversification has also improved in Adana and Mersin provinces after 2012.

Table 3.3: The Relative Specialization Index Values for Adana

2008			2012			2017		
Code	Branch of activities according to NACE Rev.2 Classification	LQ	Code	Branch of activities according to NACE Rev.2 Classification	LQ	Code	Branch of activities according to NACE Rev.2 Classification	LQ
17	Manufacture of paper and paper products	1.12	33	Repair and installation of machinery and equipment	1.22	17	Manufacture of paper and paper products	1.09
27	Manufacture of electrical equipment	1.22	13	Manufacture of textiles	1.26	22	Manufacture of rubber and plastic products	1.14
28	Manufacture of machinery and equipment n.e.c.	1.35	28	Manufacture of machinery and equipment n.e.c.	1.32	13	Manufacture of textiles	1.18
11	Manufacture of beverages	2.68	11	Manufacture of beverages	3.06	20	Manufacture of chemicals and chemical products	1.95
19	Manufacture of coke and refined petroleum products	6.23	19	Manufacture of coke and refined petroleum products	5.99	11	Manufacture of beverages	2.91

When we look at the sectors that Adana specializes in, it is seen that the sector of manufacturing of beverages is among the top 5 sectors that specialize in every analysis year. Until the highway was built, manufacture of coke and refined petroleum products sector was the most specialized sector in the province. When the specialization value of the province is examined, it is seen that this value decreases after the highway has been constructed. It is observed that the sectors where the province specializes after the highway has been changed.

Table 3.4: The Relative Specialization Index Values for Mersin

2008			2012			2017		
Code	Branch of activities according to NACE Rev.2 Classification	LQ	Code	Branch of activities according to NACE Rev.2 Classification	LQ	Code	Branch of activities according to NACE Rev.2 Classification	LQ
16	Manufacture of wood materials	1.13	20	Manufacture of chemicals and chemical products	1.41	17	Manufacture of paper and paper products	1.30
17	Manufacture of paper and paper products	1.33	16	Manufacture of wood materials	1.49	23	Manufacture of other non-metallic mineral products	1.36
12	Manufacture of tobacco products	1.44	23	Manufacture of other non-metallic mineral	1.49	11	Manufacture of beverages	1.37

Code	Branch	LQ	Code	Branch	LQ	Code	Branch	LQ
				products				
23	Manufacture of other non-metallic mineral products	1.44	11	Manufacture of beverages	1.79	16	Manufacture of wood materials	1.54
20	Manufacture of chemicals and chemical products	1.50	12	Manufacture of tobacco products	3.70	12	Manufacture of tobacco products	6.57

When we look at the sectors that Mersin specializes in, it is seen that the sectors of manufacturing, wood materials, tobacco products and other non-metallic mineral products are among the 5 most specialized sectors in each analysis year. It was observed that the sector's specialization values increased after 2012 when the highway was built. With the construction of the highway, the expertise of the province in the manufacturing of tobacco products sector has increased.

Table 3.5: The Relative Specialization Index Values for Niğde

2008			2012			2017		
Code	Branch of activities according to NACE Rev.2 Classification	LQ	Code	Branch of activities according to NACE Rev.2 Classification	LQ	Code	Branch of activities according to NACE Rev.2 Classification	LQ
15	Manufacture of leather and related products	1.30	11	Manufacture of beverages	1.26	10	Manufacture of food products	1.15
10	Manufacture of food products	1.70	10	Manufacture of food products	1.31	33	Repair and installation of machinery and equipment	1.23
23	Manufacture of other non-metallic mineral products	2.19	23	Manufacture of other non-metallic mineral products	1.55	15	Manufacture of leather and related products	1.39
13	Manufacture of textiles	2.36	13	Manufacture of textiles	1.77	13	Manufacture of textiles	1.99
11	Manufacture of beverages	7.50	15	Manufacture of leather and related products	1.80	11	Manufacture of beverages	2.63

When we look at the sectors that Niğde specializes in, we see that the sectors of manufacturing, leather and related products, food products, textiles, beverages are among the top 5 sectors that specialize in every analysis year. The expertise of the province in the manufacture of beverages sector has been the sector that was the most expert in the province in 2017, even though the year of the highway experienced a great decline. After 2008, the specialization value of the province decreased in general.
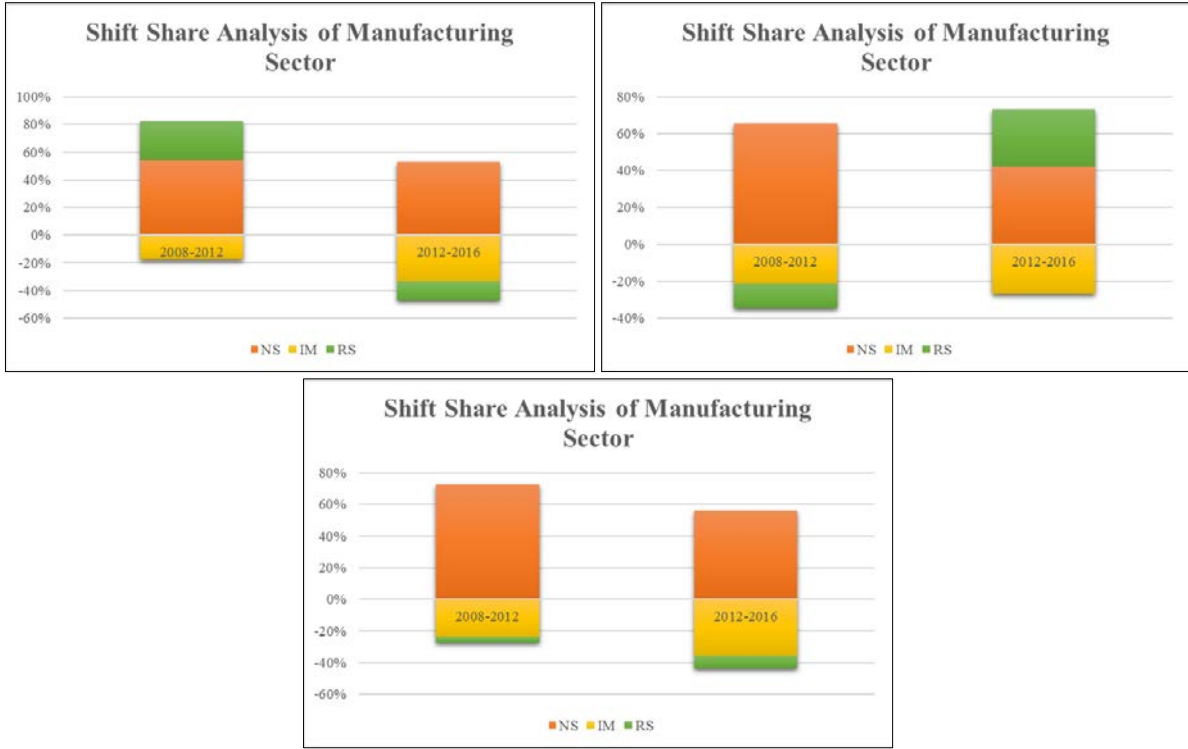
Figure 3.4: Shift-Share Components of Mersin (Left), Adana (Right) and Niğde (Down) for manufacturing sector

The percentages of the three components of employment change in the total manufacturing sector are shown in Figure 3.4 for Mersin, Adana and Niğde. Accordingly, it seems that national growth has the most impact on the total employment change in all regions. Moreover, the National Growth component has had a positive impact on the change in employment in all regions, regardless of the date of the road. In addition, the Industrial Mix component in all regions has a negative impact on total employment change. When the Regional Shift component is examined, it is observed that this component had a positive impact at the beginning but then it had a negative impact on employment change in Adana. In addition, it is understood that the component of Regional Shift had a negative impact on employment change at the beginning in Mersin, on the contrary of Adana. For Niğde, it seems that this effect has a constant negative effect.

3.3.2. O-31 İzmir-Aydın Highway

Table 3.6: The Relative Diversity Index Values for O-31 Highway Provinces

RDI	2008	2010	2017
İzmir	9.163466	10.56861	10.94129
Aydın	6.08877	6.008241	5.584921

According to the RDI analysis for the manufacturing sector in Izmir and Aydın, while the diversification of İzmir in the manufacturing sector has been increasing, the diversification of Aydın has been decreasing.

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Table 3.7: The Relative Specialization Index Values for İzmir

2008			2010			2017		
Code	Branch of activities according to NACE Rev.2 Classification	LQ	Code	Branch of activities according to NACE Rev.2 Classification	LQ	Code	Branch of activities according to NACE Rev.2 Classification	LQ
27	Manufacture of electrical equipment	1.83	33	Repair and installation of machinery and equipment	1.55	11	Manufacture of beverages	1.60
15	Manufacture of leather and related products	2.06	15	Manufacture of leather and related products	1.98	28	Manufacture of machinery and equipment n.e.c.	1.77
17	Manufacture of paper and paper products	2.34	17	Manufacture of paper and paper products	2.17	20	Manufacture of chemicals and chemical products	1.88
19	Manufacture of coke and refined petroleum products	2.91	19	Manufacture of coke and refined petroleum products	3.28	19	Manufacture of coke and refined petroleum products	5.10
12	Manufacture of tobacco products	5.32	12	Manufacture of tobacco products	12.18	12	Manufacture of tobacco products	8.74

When we look at the sectors that İzmir specializes in, it is seen that the sectors of manufacturing, tobacco products and refined petroleum products are among the top 5 sectors that specialize in every analysis year. In 2010, when the highway was built, there was an increase in the specialization value of İzmir especially in the manufacture of tobacco products sector. The coke and refined petroleum products sector are the sectors in which Izmir has increased its specialization since 2008. It is seen that the province is the center of the manufacturing of tobacco products and refined petroleum products.

Table 3.8: The Relative Specialization Index Values for Aydın

2008			2010			2012		
Code	**Branch of activities according to NACE Rev.2 Classification**	**LQ**	**Code**	**Branch of activities according to NACE Rev.2 Classification**	**LQ**	**Code**	**Branch of activities according to NACE Rev.2 Classification**	**LQ**
23	Manufacture of other non-metallic mineral products	1.34	23	Manufacture of other non-metallic mineral products	1.34	16	Manufacture of wood materials	1.04
16	Manufacture of wood materials	1.65	11	Manufacture of beverages	1.42	23	Manufacture of other non-metallic mineral products	1.58
27	Manufacture of electrical equipment	1.74	16	Manufacture of wood materials	1.73	10	Manufacture of food products	2.11
10	Manufacture of food products	1.99	27	Manufacture of electrical equipment	2.15	28	Manufacture of machinery and equipment n.e.c.	2.14
11	Manufacture of beverages	2.51	10	Manufacture of food products	2.16	11	Manufacture of beverages	3.41

It is seen that manufacture of other non-metallic mineral products, wood materials, food products and beverages sectors are among the top 5 specialized sectors in each analysis year. Since 2010, when the highway was built, the value of specialization in the sectors increased and the employment level in the region increased compared to national values in the first 3 sectors.
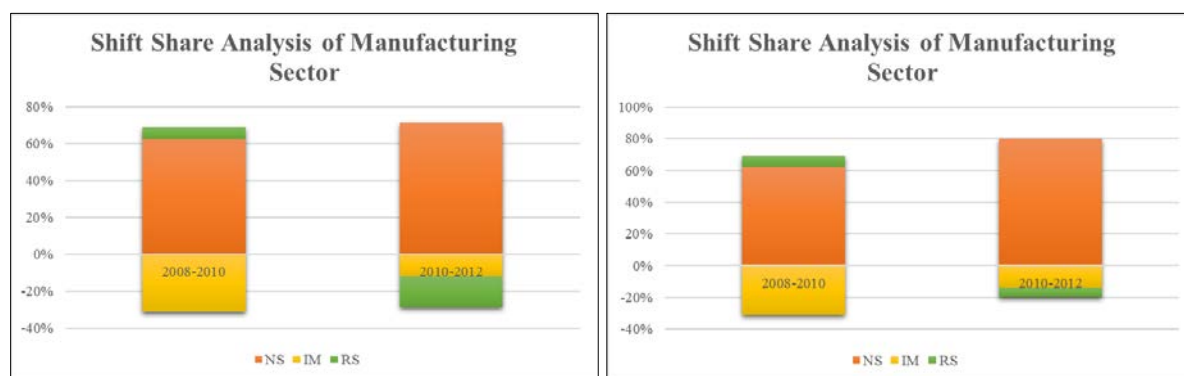

Figure 3.5: Shift-Share Components of İzmir (Left) and Aydın (Right) for manufacturing sector

The percentages of the three components of employment change in the total manufacturing sector are shown in Figure 3.5 for İzmir and Aydın. According to this, National Growth seems to have the most impact in explaining the total employment change in all regions. In addition, the National Growth component has had a positive impact on the change in employment in all regions irrespective of the date of highway construction. In addition, the Industrial Mix component in all regions has a negative impact on total employment change. When the

Regional Shift component is examined, it is observed that this component initially had a positive and then negative impact on employment change in both regions.

3.3.3. O-52 Gaziantep-Şanlıurfa Highway

Table 3: The Relative Diversity Index Values for O-52 Highway Provinces

RDI	2008	2009	2017
Gaziantep	2.718057	2.796393	2.99752
Şanlıurfa	5.13065	5.772242	7.660152

According to the analysis of the RDI for manufacturing sector in Gaziantep and Sanliurfa, the diversification in the manufacturing sector has increased since 2008 in the provinces where the O-52 highway passes. Especially in Şanlıurfa, a high rate of increase is observed after 2009 when the highway was built. In Gaziantep, there has been a lower increase compared to Şanlurfa.

Table 4: The Relative Specialization Index Values for Gaziantep

2008			2009			2017		
Code	Branch of activities according to NACE Rev.2 Classification	LQ	Code	Branch of activities according to NACE Rev.2 Classification	LQ	Code	Branch of activities according to NACE Rev.2 Classification	LQ
17	Manufacture of paper and paper products	1.47	17	Manufacture of paper and paper products	1.49	10	Manufacture of food products	1.55
10	Manufacture of food products	1.50	10	Manufacture of food products	1.53	22	Manufacture of rubber and plastic products	2.67
22	Manufacture of rubber and plastic products	2.28	22	Manufacture of rubber and plastic products	2.27	17	Manufacture of paper and paper products	3.15
15	Manufacture of leather and related products	2.51	15	Manufacture of leather and related products	2.95	15	Manufacture of leather and related products	3.40
13	Manufacture of textiles	6.00	13	Manufacture of textiles	6.35	13	Manufacture of textiles	6.85

In Gaziantep, the 5 sectors that are the most specialized in the 2008 – 2017 period have not changed. After the highway construction, employment increased compared to national employment in all sectors where the province is specialized. The sectors that the province is specialized in are not dependent on natural resources. Gaziantep have remained unchanged in their specialization patterns over the 9 years. It can be said that Gaziantep is a textile center in the region.

Table 5: The Relative Specialization Index Values for Şanlıurfa

2008			2009			2017		
Code	Branch of activities according to NACE Rev.2 Classification	LQ	Code	Branch of activities according to NACE Rev.2 Classification	LQ	Code	Branch of activities according to NACE Rev.2 Classification	LQ
19	Manufacture of coke and refined petroleum products	0.87	10	Manufacture of food products	0.86	13	Manufacture of textiles	0.72
11	Manufacture of beverages	1.08	11	Manufacture of beverages	0.92	33	Repair and installation of machinery and equipment	0.78
23	Manufacture of other non-metallic mineral products	1.16	23	Manufacture of other non-metallic mineral products	1.07	23	Manufacture of other non-metallic mineral products	0.85
28	Manufacture of machinery and equipment n.e.c.	1.27	28	Manufacture of machinery and equipment n.e.c.	1.24	14	Manufacture of wearing apparel	0.93
13	Manufacture of textiles	2.01	13	Manufacture of textiles	1.73	15	Manufacture of leather and related products	1.48

In Şanlıurfa, manufacture of textiles and other non-metallic mineral products sectors are among the top 5 specialized sectors in each analysis year. It is seen that the province is specialized in textile and leather products and this trend has not changed.
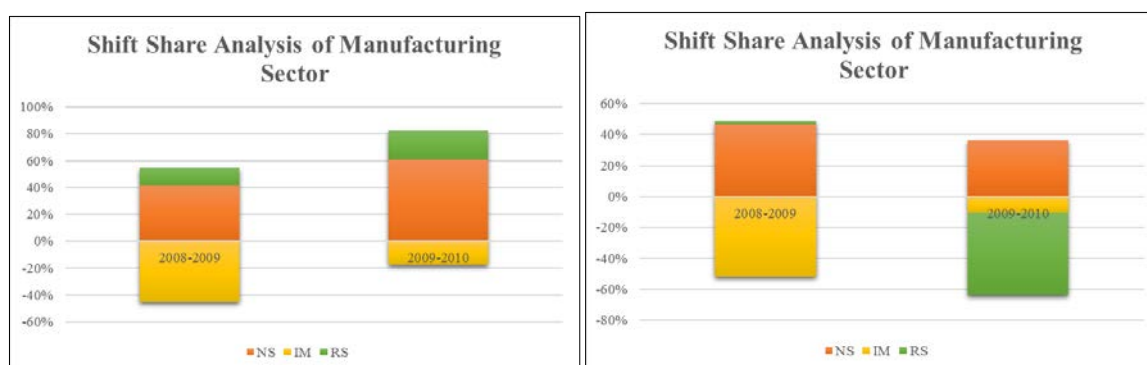

Figure 3.6: Shift-Share Components of Gaziantep (Left) and Şanlıurfa (Right) for manufacturing sector

The explanation of the three components of the change in total employment in the manufacturing sector is shown in Figure 3.7 for Gaziantep and Şanlıurfa. According to this; National Growth does not seem to have the most impact in explaining the total employment change in Gaziantep and Şanlıurfa. In the beginning period of Gaziantep and Şanlıurfa, the Industrial Mix component had the most impact in explaining the change in employment.

While the Industrial Composition component was the most effective in explaining the change in employment before the highway was made in Şanlıurfa, it was observed that the Regional Exchange component had the most impact in explaining the total employment change after the date of highway construction. Parallel to this, the Industrial Mix component had a negative impact on the change in employment before the highway was constructed, and it seems that the Regional Shift component had a negative impact on the total employment change after the highway was constructed. In addition, the Industrial Mix component in Gaziantep has a negative impact on total employment change. When the Regional Shift component is examined, it is observed that this component had a positive impact at the beginning and then it had a negative impact on employment change in Şanlıurfa. The Regional Shift component in Gaziantep seems to have consistently a positive impact on employment change.

3.3.4. Overall Results

According to the analysis results given in table 3.12, the regions where the most employment increases were 16550 and 18.126 people before construction of the highway are Adana and Izmir. In the analysis period after the construction of the highway, the region with the highest employment increases is İzmir with 24.320 people. According to the Industrial Mix values, it can be interpreted that this component is not positive for any region in any analysis period and accordingly there are no fast-growing sectors. In addition, by looking at the negativity and the size of the industrial composition value, it can be said that in Gaziantep and Şanlıurfa, the share of the sectors that grew slowly in the sector composition was very high after the highway construction period.

Table 6: Shift-Share Analysis of the manufacturing sector

	NS	IM	RS	Total Shift	Zone	NS	IM	RS	Total Shift	Zone
Province			**2008-2010**					**2010-2012**		
İzmir	27486.74	-13663.91	2727.18	16550.00	IV	40650.56	-6843.26	-9487.31	24320.00	III
Aydın	3218.87	-1600.13	340.26	1959.00	IV	4764.41	-802.06	-371.35	3591.00	III
Province			**2008-2012**					**2012-2016**		
Adana	15081.72	-4944.29	7988.58	18126.00	IV	9293.90	-5885.10	-2328.79	1080.00	III
Mersin	10682.30	-3502.02	-2150.29	5030.00	III	5382.35	-3408.23	3978.87	5953.00	IV
Niğde	2364.50	-775.16	-108.34	1481.00	III	1247.89	-790.19	-173.70	284.00	III
Province			**2008-2009**					**2009-2010**		
Gaziantep	19787.56	-21765.59	6314.04	4336.00	IV	9204.27	-2638.52	3320.26	9886.00	IV
Şanlıurfa	4224.11	-4646.36	155.26	-267.00	IV	1781.51	-510.69	-2608.82	-1338.00	III

It can be concluded that the value of Regional Shift was positive before the construction of the highway, and that the share of rapidly growing sectors in İzmir, Aydın, Adana, Gaziantep and Şanlıurfa has increased during the period and that these regions have a competitive

advantage in the fast growing sectors. On the other hand, it can be said that the share of fast-growing sectors has decreased and these regions do not have competitive advantages in regions where the Regional Shift component is negative, such as Mersin and Niğde. However, after the construction of the highway in Izmir, Aydın, Adana and Sanliurfa, Regional Shift values were negative, while Mersin was positive. Therefore, it can be said that the competitive advantages of these regions are reversed by making the highway.
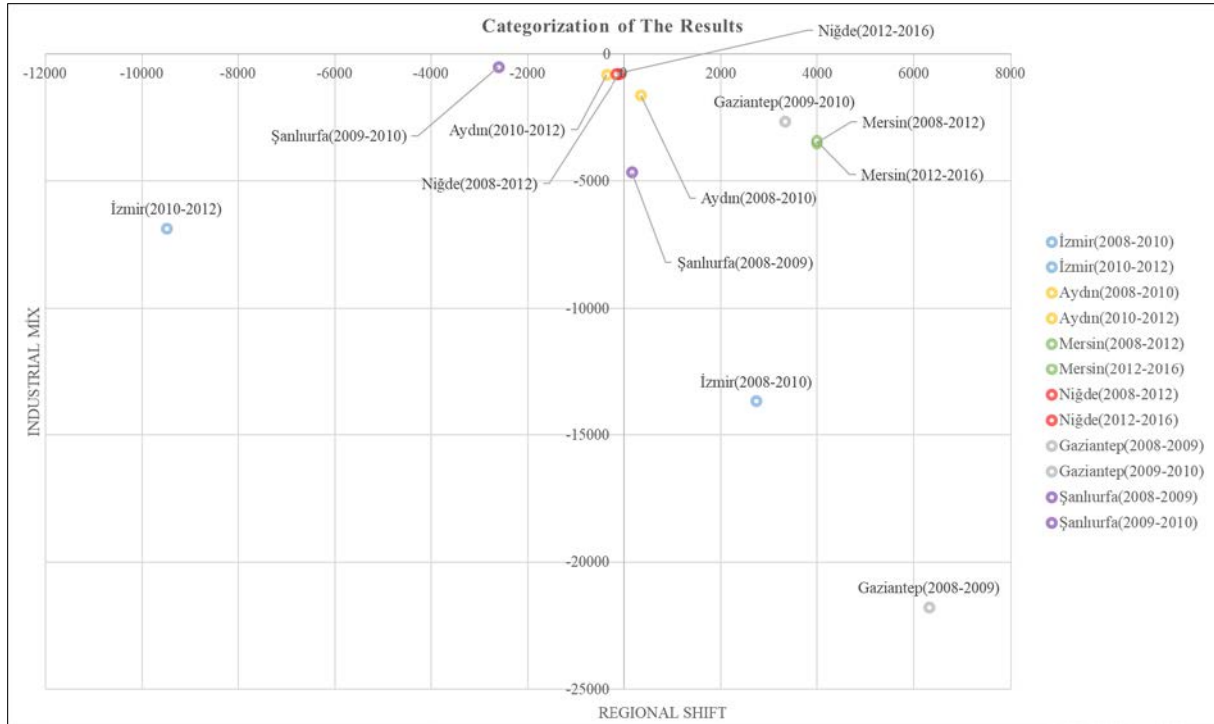

Figure 3.7: Regional distribution of Industrial Mix and Regional Share components in total employment change

The regions of NUTS3 in Figure 3.9 are divided into four zones based on the values of industrial composition and regional exchange components in Figure 3.8. According to this, in Figure 3.8;

- NUT3 regions in the I. Zone (IM + RS +), where the share of fast-growing sectors at the beginning increased,

- NUT3 regions in the II. Zone (IM - RS +), where the share of slow-growing sectors at first declined,

- NUT3 regions in the III. Zone (IM - RS -), where the share of slow-growing sectors at the beginning increased,

- NUT3 regions in the IV. Zone (IM + RS -), where the share of fast-growing sectors has decreased.

Figure 3.8 shows the distribution of Industrial Mix and Regional Shift components in the employment change of manufacturing industry for the NUT3 regions. In the Shift-share Analysis for manufacturing industry, this graph consists of only two regions because of negative value of industrial composition in all regions except Niğde, shows that the regions are separated before and after the construction of the highways. According to the analysis results, the negative value of the industrial compound component in all regions except Niğde indicates that the manufacturing sub-sectors which initially grew slowly in all sectors are included. Since these regions have different values over the years, it is generally understood that they are clustered in the IV. Zone before construction of the highways. Moreover, it can be said that after the construction of the highways, the regions are clustered in III. Zone.
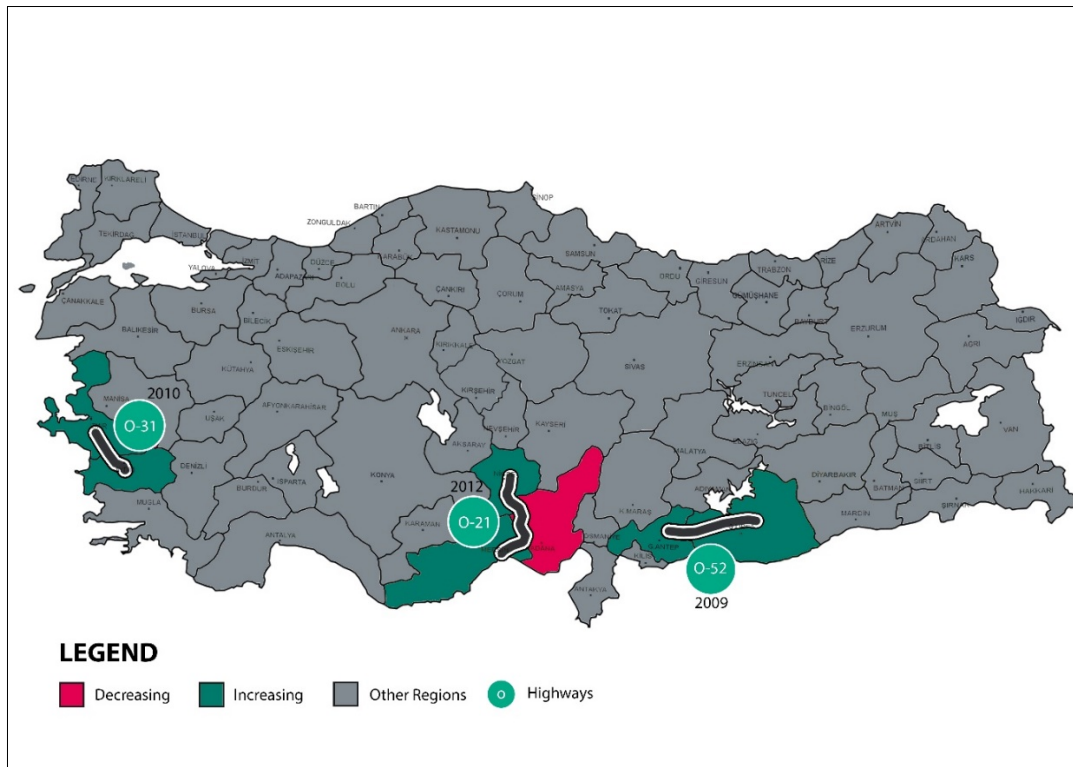

Figure 3.8: Changing the share of Regional Share according to the construction date of highway by region

When the Regional Shift Component which ise the most important component of the analysis is examined, the sectoral share enhancement in İzmir, Aydın, Mersin, Niğde, Gaziantep and Şanlıurfa, respectively, is attributed to the competitive advantages of the regions in those sectors. After the construction of the highways in İzmir, Aydın, Adana and Şanlıurfa where the Regional Shift component is negative, despite the fact that the fast-growing manufacturing sub-sectors are located, the regions can be interpreted to have lost employment because they do not have competitive advantages in those sectors.. In addition to the regions where the

manufacturing industry has not developed, there are traditional industrial centers such as TR31 (Izmir) and TR62 (Adana- Mersin). When the Regional Shift component, which is highlighted as the most important component of the Shift-Share analysis, is listed in all regions for the manufacturing industry, the regions with the highest Regional Shift value before the construction of the highway are Adana, Gaziantep and İzmir. After the construction of the highway, the regions with the highest regional exchange value are Gaziantep and Mersin.

In addition to the results of these analyses, the development agency sector reports of the provinces where the provinces are located are examined and interpreted in parallel with the analyses. First, despite the increase the specialization in the manufacturing of tobacco products in Izmir, this is not directly related to the construction of the highway. The Aegean region has a high share in tobacco production for years (Karabacak, 2017). Achieving productive crops and increasing the number of tobacco cultivation areas in İzmir also increased the specialization in the region. Although this is not directly related to the highway, it can be said that the highway construction has a positive effect on the region in terms of product flow. Secondly, in Mersin, specialization has been increased in the manufacturing of tobacco products sector after the construction of the highway and these sectors have been the most specialized sector in the province. However, it is not possible to determine why these provinces, which do not stand out in the production of tobacco in Türkiye, experienced such an increase after the highway construction. Finally, there has been a 483% increase in the number of exporting firms in Sanliurfa between 2002-2012. Although the export value of the province decreased due to the Syrian crisis after 2010, the increase in the number of companies here affected the region positively. The region's competitive performance in the export of manufacturing industry products in the region and the tendency to develop rapidly are parallel to the positive changes in the analysis. (KK Ajansı, 2011). According to the studies carried out in the TRC2 regional plan analyses, it is stated that the region's competitiveness in the manufacturing industry was negative, the expected growth was not realized, and the industrial investments shifted to more competitive provinces. This shows that the region needs infrastructure investments that will boost its competitiveness to attract industrial investments. It is stated that the manufacturing sector has entered the process of development in Sanliurfa and it has a competitive advantage in certain sectors, but many sectors have gone to more competitive regions. Compared to Türkiye, employment in the

manufacturing sector is far behind from Türkiye. According to URAK Analyses, Şanlıurfa is ranked lowest in the competition index of Türkiye. (KK Ajansı, 2013).

CONCLUSION

Transport infrastructure plays an important role in increasing national and regional economic growth and creating economic mobility for sectors. The presence of transport infrastructure in a region also determines the attractiveness of investment for many sectors and the competitiveness of the regions on a global scale. Therefore, most developed and developing countries in the world today evaluate the impact of transportation on regional development. Advanced transportation means advanced logistics, and this is important for a region's goods flow and competitiveness. Accordingly, highways are the most effective transportation infrastructure that facilitates the flow of goods and services. In most countries of the world, especially in highways, transportation infrastructure investments are closely related to the development of the region. Highways affect the competitiveness and accessibility of the regions. In Türkiye, highway projects are carried out by the General Directorate of Highways (KGM) with the Build-Operate-Transfer model and naturally support regional development and economy in the long term. The aim of this article is to emphasize the effect of the transportation mentioned in the literature on regional development by understanding the regional analysis methods and analyzing these methods with regional dynamics. To achieve this goal, the impact of the O-21, O-31 and O-52 highways in three different geographies in Türkiye on Izmir, Aydın, Adana, Mersin, Nigde, Gaziantep and Sanlıurfa regions and the economic performance analyses of these regions on the date of the road are analysed. Therefore, this article examines a research question. Whether the highways have a direct or indirect impact on regional development and how the economic performance of the regions on these highways has changed after the construction of the highways is questioned. In doing so, first the literature is used and then the open highways are identified in Türkiye. According to the years of construction of these highways, NUT3 regions are selected as domains. Labor force data collected by Social Security Institution in 2008-2017 were gathered to measure the economic performance of these selected regions by highway. Secondly, quantitative research methods are used, and the reliability of the research is ensured by qualitative data analysis. Regional analysis methods, such as Relative Specialization Index, Relative Diversity Index and Shift-share Analysis, are used for Quantitative Research. In addition, as a qualitative data analysis method, sectoral change is examined from development agency reports according to

year and area where highway is built. Finally, as a result of the collected data and analyses, the economic performance analyses of the highways are discussed in order to evaluate the regional effect of the highways according to quantitative research methods.

As a result, in the first phase of the quantitative research methods RDI and RZI, the regions in general are more diversified in the long-term in manufacturing sector and more specialized in certain manufacturing sub-sectors. It can be said that the provinces in different geographical regions perform differently in the manufacturing sector if generalization is performed according to the traditional shift-share analysis, which is the other quantitative method within this analysis. It cannot be said that the highway has a direct impact on the performance of these provinces in the manufacturing sector. Therefore, according to sectoral information collected from the development agency of the regions by qualitative data analysis, it is understood that the competitiveness performances in the manufacturing sectors of the regions are affected by many different events. As a result of the research, the highways affect regional development in general, but it is not possible to determine whether it has a positive or negative effect. It is understood that economic performance of the regions differs between these provinces in different geographies. In order to obtain more reliable results in future studies, the methods used in the research should be diversified and further sub-dynamic should be examined.

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