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Export capacity to integrate global networks and its impacts on regional economic success: A provincial analysis in Turkey

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Abstract
Export capacity can be used to integrate global networks in order to facilitate and enhance regional economic development. This tactic has been especially prevalent since the 1990s. This study focuses on the relationship between export capacity and regional economic success based on case study findings in 81 Turkish provinces. The findings of the case study are first discussed in terms of Turkish geography. Modeling results show that although there is a positive and significant relationship between regional income and industrial development in terms of export capacity, a region's centrality in national networks is not related to its export capacity. Accordingly, the positive relationship between a border effect and export capacity is likely to yield economic development strategies for border regions.

Keywords
Border regions, Export capacity, Global networks, Regional economic success, Provinces in Turkey.

1. Introduction

Export capacity has been an effective way of integrating global networks, and has frequently been used in scientific articles as an unambiguous measurement of global networks (Rodrigue, 2014, Çavuşgil & Knight, 2015). Increasing exports in high value-added products is an important regional economic development strategy. In the regional development literature, there is a number of studies highlighting the positive relationship between regional export capacity and economic regional success (Storper and Harrison, 1991, Sala-i-Martin, 1996). Therefore, it has become increasingly important to accurately and comprehensively measure regional economic success. Here, regional income data is primarily used in addition to other related economic variables.

The main objective of the paper is to demonstrate to what extent a high export capacity as an effective way of integrating global networks at the provincial level positively interacts with the economic success and, by extension border effect. Specifically, we investigate 81 NUTS3 provinces in Turkey. In this context, sub-hypotheses determine which indicators are to be used to measure economic success and the relation of these indicators to the export capacity. Accordingly, this research contributes to the evaluation and reexamination of regional economic framework.

The paper is organized as follows. Section two describes the theoretical framework of finding relationships between export capacity and economic success. Section three introduces the methodological design used to evaluate the case study. The fourth section fully explains the case study findings. Finally, the conclusions from this paper follow in Section five.

2. Theoretical framework: Export capacity as a means of integration with global networks and subsequent economic success

The impact of foreign trade on economic growth has been a topic of debate for many years, in different disciplines (Belloumi, 2015). These debates increased after the 1970s, especially when countries abandoned protectionist policies and adapted free trade policies. Regional growth discussions regarding exports were based on the expectation that exports would bring economic success and income increases. To a large extent, this has come to fruition with globalization (Hirst, Grahame and Bromley, 2009).

In particular, the role of foreign trade in regional growth models has developed in parallel with the development of free-trade policies and the emergence of the internal growth model. Romer (1994) argues that the liberalization of foreign trade will create positive effects on economic conditions and lead to economic growth. Economists such as Krugman (1991; 1995), Grossman and Helpman (1991; 2003), and Romer (1990; 1995) have conducted important studies on this subject.

For example, in competitive networks, producers and consumers in distant regions can share information through foreign trade activities. Grossman and Helpman (2003) link long-term regional economic success to knowledge spillover through international trade, arguing that global competitiveness affects regional development. Specifically, regional integration into the global economy is one of the most important factors determining regional development and potential development. In general, a region's competitive advantage is measured by its integration into global networks.

In this vein, a region's industrial production plays an important role in its economic success. Industrial clustering approaches, which emerged in tandem with internal growth approaches, are indicative of how important industry is for economic success. These approaches focus on the spatial and organizational structure of particular industries (Delgado, et.al.2014, Cooke & Morgan 1994, Schimitz, 1995). Although studies on clustering primarily emphasize emerging local networks of related industries, various studies have shown that the capacity of local clusters to connect with global networks contributes to the economic success of their regions (Armatlı et.al., 2012; Eraydın & Armatlı 2005, Baptista 1996). Such geographically disparate interre-

latedness on both the local and global scales is also redefining our concepts of space and distance. Because of this, the means of production can range from local to global networks. This distribution can vary depending on the nature of an industry, company, production structure, and technological novelty. As local networks prohibit growth for many emerging and existing companies (Crespo, et.al., 2014; Glasmeier, 1999), the importance of global relationships and the combination of different network types is becoming more evident (Eraydın & Armatlı, 2005, Asheim & Isaksen, 2002; Freel, 2003; Patrucco, 2003). Given these network types, access to a national market and centrality within national networks has been especially prominent factors in cluster discussions. However, the power of such integration into national networks has not been clearly defined as for integration with global networks (Armatlı, 2004; Hemert, et.al. 2013).

In addition, the concept of a regional economic success within global networks has brought about terms such as "world cities" and "global cities" (Friedmann 1986; Sassen 2001; Alderson & Beckfield 2004). A global city's economic success is not defined in terms of all of its industries; rather, its information-based services are critically important. In transaction networks between cities, migration, tourism, and business travel, among other migratory activities, enable quick and widespread development.

Accordingly, the mobility of capital and information define urban networks. People, capital, and information networks play an important role in the power and centrality of cities within larger networks. Interestingly, economic success in global urban approaches is formulated through global networks, while being centralized in national networks is not directly linked to economic success. This is directly related to export capacity, which is the main indicator of integration into global networks, regardless of whether or not there are advantages in spatial proximity and spatial continuity (border regions).

Border regions are crucial case studies through which to understand the contradictions and dynamics of globalization that the whole world faces (Herzog, 2014). Since border regions are an administrative boundary, both sides depend on different administrative regulations (countries) and international agreements to regulate interregional trade. However, as threats, such as terrorism, increase with globalization, governments' security demands make borders more important, thereby reducing a city's commerce from their permeability (Herzog, 2014).

Therefore, the availability of infrastructure, such as transport, is also determined by this permeability. Between neighboring countries, a special set of agreements promote trade; however, in extreme cases such as war, border crossing is heavily regulated. Despite the existence of international commercial agreements, the attractiveness of border regions is not as high as that of regions connected to national and global networks. Thus, this geographical and political reality must be utilized to gain competitiveness for regional economic success.

3. Methodological aspects of the case study; Export capacity and regional economic success

This study investigates how provincial economic success influences export capacity, which is considered to be an effective way of connecting with global networks. Important metrics of provincial economic success are employment in the manufacturing sector, regional income, integration into the national network, and the border effect. In response, the following research questions have been posed:

- Is there a relationship between export capacity and income level in a region?
- How does a regionally clustered manufacturing industry affect regional export capacity?
- How does integration into a national market affect regional export capacity?
- What is the relationship between border regions and regional export capacity?

Level databases for all 81 provinces (NUTS3) in Turkey were searched in response to these research questions. A

regression analysis was then utilized to assess the data. Here, provincial export capacity was the dependent variable, while income, employment within the manufacturing industry, level of integration into the national network, and border conditions served as independent variables.

TURKSTAT 2012 export data was used to assess the export capacity of all provinces. Table 1 shows the definition and data source for the four independent variables. The assumption in including income in the model based on the case study data is that high-income regions will have greater export capacity. In order to capture regional income data, accrued income tax data has been used. In cases where there is no provincial GDP data, such as Turkey, this metric is an acceptable approximation of income distribution.

Furthermore, it was predicted that manufacturing production would be highest in areas densely populated with manufacturing facilities, and the resulting comparative increase in production would result in more exports. Accordingly, manufacturing industry employment was measured by the number of employees registered in the manufacturing industry in a given province according to SSI records

(2012). In the model, provincial centrality values within the national network analysis were used as proxy for national networks.

An Eigenvector centrality value derived from a statistical network analysis of provincial airway, railway, and road data has been used to represent the national network. Here, the weight of the nodal points in the cluster/neighboring unit and the distance between the points were calculated using GEPHI software (Newman, 2000, McSweeney, 2009). For airlines and railways, Eigenvector centrality values were calculated separately. Conversely, it was not possible to carry out a network analysis for highway data using GEPHI because there were no definite exit and destination data.

For this reason, the highway Eigenvector centralization value was determined to be the sum of traffic flow from other provinces to the provincial center, and from the provincial center to other provinces. After determining the total number of vehicles for each province, a centrality value between 0 and 1 was produced by setting the value of the highest province (Istanbul) at 1. Ultimately, a single centrality was obtained from three centrality values acquired by weighting airway, railway,

Table 1. *The variables used in the model.*

Variables		Definitions	Data Source
Dependent Variable	Regional Export capacity	Export value of provinces (Dollar)	TURKSTAT, NUTS 3 level, 2012.
Independent Variables	Regional income	The amount of income tax accrued in the province	The Ministry of Finance, General Directorate of Accounting, 2012.
	Employment in manufacturing	Registered number of employees in the manufacturing industry in the province	Social Security Institute (SSI), 2012.
	Centrality of national networks	Network analysis carried out with current data obtained from the highway, airline, railway Eigenvector centrality values between the provinces	General Directorate of Highways, 2012. State Railways Headquarters, 2012. State Airports Management General Directorate, 2012
	Border	Being at the border (dummy variable)	

Figure 1. Provincial share of total Turkish exports (TURKSTAT, 2012).

and highway data equally and deriving a single Eigenvector centrality value for each province.

The last variable addressed in the model was the border effect, with the expectation that spatial proximity to exporting countries will increase export capacity. In previous studies, both regional development and economic success were lower in border provinces. However, if the regional success metrics are low in border regions, the regions are expected to stand out in export capacity. In the model, border regions are considered dummy variables.

4. Findings from the case study

The dependent and independent variables used in the model were examined spatially, for Turkish provinces, before regression analyses (OLS). Specifically, export capacity, the dependent variable, was analyzed spatially, followed by income tax, employment in the manufacturing sector, and centrality within the national network.

4.1. Export capacity of Turkish provinces

Provincial share of total exports, total imports, and the value of exports minus imports were geographically evaluated for each Turkish province.

4.1.1. Export capacity of provinces

The national distribution of provincial export shares revealed that exporting provinces are located in the West and South. The following four main export regions were identified: the Izmir region, Ankara region, Istanbul region, and Adana-Gaziantep region, each with its own surrounding provinces (Figure 1). Istanbul accounted for 50.3% of total exports made in Turkey in 2012. The top 12 provinces, each with 1% or more share of total national exports, accounted for an aggregate of 87.1% of Turkey's exports.

The remaining 69 provinces shared 10.9% of Turkey's exports. Kocaeli, Bursa, and Sakarya formed a dominant region near İstanbul that was responsible for 50,0% of Turkey's exports. The province of Kocaeli came in second, after Istanbul, in total share of national exports, while the Bursa province ranked third. Kocaeli's share of exports was 8.3%, and Bursa's share was 7.3%. Together, Istanbul region with the Kocaeli, Bursa, and Sakarya provinces accounted for 67.0% of Turkey's exports. Clearly, Istanbul and the surrounding provinces were the most important exporters in Turkey in 2012.

Near İzmir, Manisa and Denizli stood out as an important export zone (Figure 1). İzmir ranked 4th, with 5.7% of Turkey's exports. The total national export share of İzmir, Manisa, and Denizli was 10.2%. This value was far lower than that of the region defined by Istanbul and its surrounding provinces. Meanwhile, Ankara ranked 5th in export share, following İzmir, with 4.7% share.

The total share of Ankara, Konya, and Eskişehir was 6.1%, while Gaziantep, Adana, Hatay, and Kayseri had a share of 7.3%. The Kahramanmaraş and Mersin provinces are also located on the periphery of this region (Figure 1). The Gaziantep, Adana, Hatay, and Kayseri region had a higher share than that of Ankara and its surrounding cities.
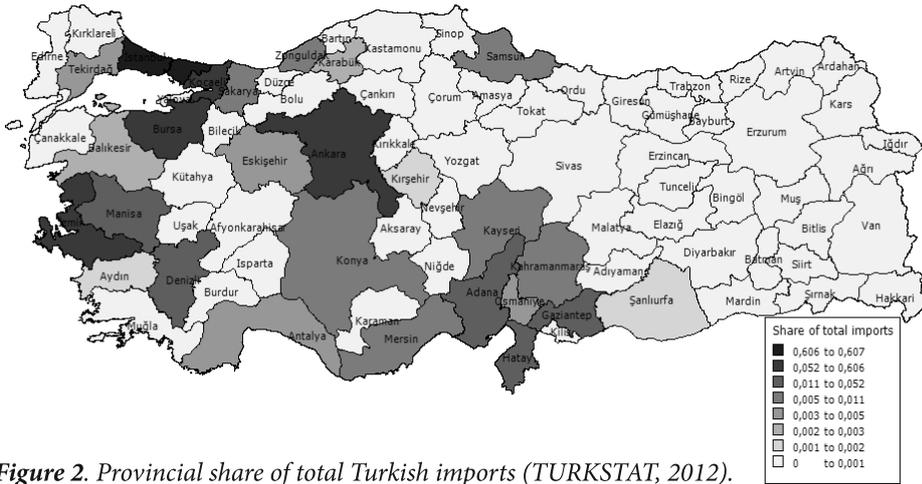
Figure 2. Provincial share of total Turkish imports (TURKSTAT, 2012).

The eastern border provinces comprising Mardin, Şırnak, and Hakkari also had a higher share than that of other eastern provinces (Figure 1). However, political international problems with Southeastern neighbors that emerged in last years, arose questions whether there has been any changes in exports at the border provinces in the region. Therefore, the changes in exports between 2012 and 2015 has been scrutinizes to see the outcomes of these political international changes. With recent changes in export regulations between 2012 and 2015, Şırnak's and Hakkari's individual shares, and those of total national exports, have decreased by approximately half (TURKSTAT, 2015). However, Mardin has maintained its export volume and its share within the country during this period.

Despite this decrease in export volume, the Mardin, Şırnak, and Hakkari regions have maintained their critical positions as important exporters in 2015, and are among the top 25 provinces in Turkey in terms of export volume. Moreover, this region's isolation from all eastern provinces has made it an interesting border region. As border provinces, Gaziantep and Hatay have maintained a higher export value than developed provinces in West Anatolia.

4.1.2. Import capacity of provinces

In Turkey, the distribution of provincial imports has followed a similar pattern as that in the exports map (Figure 1). Imports of western and southern provinces are most voluminous (Figure 2). The İzmir, Ankara, Istanbul, and Adana-Gaziantep-Ha-

tay regions have been identified as the main import zones (Figure 2). Istanbul accounted for 60.7% of total Turkish imports in 2012. The top 10 provinces, each with more than 1% share of total national imports, constitute 91.9% of Turkey's imports in aggregate.

The remaining 71 provinces shared 8.1% of Turkey's imports. Istanbul accounts for 60% of Turkey's imports, while the nearby Bursa and Sakarya regions formed a dominant import region. Kocaeli came in second place after Istanbul in national import share, and Bursa finished the fiscal year in fifth place in 2012. Kocaeli's share of national imports was 5.9%, while Bursa's share was 5.2%. The Istanbul region (İstanbul, Kocaeli, and Bursa provinces) accounted for 71.9% of Turkey's total imports. Istanbul and its surrounding region were the dominant importers and exporters in Turkey in 2012.

İzmir and its nearby provinces, Manisa and Denizli, constitute another salient import area (Figure 2). İzmir was 3rd in imports, with 5.4% share of the national import volume. The total national import share of İzmir, Manisa, and Denizli was 8.4%. This value was far behind that of the region containing Istanbul and its surrounding provinces. In addition, Ankara ranked 4th in national import share, with 5.3% of the national total, following İzmir. Provinces around Ankara (Konya and Eskişehir) did not show up in importing provinces. Finally, Gaziantep, Adana, and Hatay imported 6,3% of the goods in Turkey. The Kahramanmaraş and Mersin provinces are located on the periphery of this region (Figure 2).
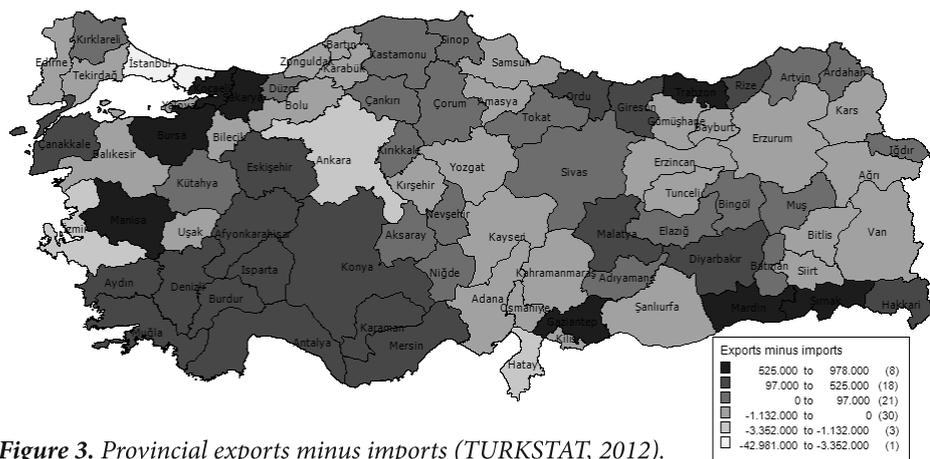
Figure 3. *Provincial exports minus imports (TURKSTAT, 2012).*

Figure 4. *Provincial income tax rate (Ministry of Finance, 2012).*

Other than the four main import zones defined above (Figure 2), there is no other region that stood out in terms of import quantity. The border area containing Mardin, Şırnak, and Hakkari was highly ranked in exports, but not in imports (Figure 2). Alternatively, the border region containing Gaziantep and Hatay stood out in imports, but was still more successful in terms of exports.

4.1.3. Provincial exports minus imports

Overall, Istanbul, Ankara, and İzmir -the three leading metropolitan areas in Turkey – were much more reliant on exports than imports. Conversely, the Hatay province can be evaluated in the same group as Ankara and İzmir, wherein the export capacity was far behind that for imports (Figure 3). The top eight provinces in which there were more exports than imports in 2012 were Kocaeli, Bursa, Sakarya, Manisa, Gaziantep, Trabzon, Mardin, and Şırnak (Figure 3).

The value of provincial exports minus imports in a given region is defined by its spatial integrity, consisting of 11 provinces located in Southwestern Turkey (Figure 3). In particular, the southern border region, extending from Gaziantep to Hakkari, stood out as a region consisting of border provinces, where exports outnumbered imports.

4.2. Indicators of regional economic success in Turkish provinces

In this section, income level, employment in the manufacturing industry and provincial centrality in the national network are analyzed in terms of economic stability.

4.2.1. Total provincial income tax

Istanbul and Ankara were first in income tax, followed by Kocaeli, Bursa, İzmir, and Antalya (Figure 4). The group with the third highest income tax consisted mostly of provinces located in western regions. Istanbul's share of total income tax was 46.2%, and Ankara's share was 12.1% (Table 4). Beyond

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Figure 5. Registered manufacturing industry labor force shares in Turkish provinces (SSI, 2012).

the top two, İzmir's share was 5.7%, Bursa's was 3.4%, and Kocaeli's share was 2.9% (Ministry of Finance, 2012). Although the three metropolitan areas were leading at all the economic development indicators, Istanbul was clear ahead of all metropolitan regions .

Furthermore, income tax accrued in the region consisting of Bartın, Karabük, Çankırı, Kırıkkale, Kırşehir, Nevşehir, Aksaray, and Niğde, which descends from Bartın in the North to Niğde, was considerably lower than that of surrounding areas. In the West, Bilecik, Uşak, Isparta, and Burdur also had a lower income tax rate than the surrounding areas (Figure 4).

This income tax map differs from the foreign trade maps according to its spatial pattern. Specifically, the provinces in the East, including Hatay, Gaziantep, Şanlıurfa, Van, Kırıkkale, and Edirne, also stood out in terms of income tax (Figure 4).

4.2.2. Employment in the manufacturing industry

Provincial employment in the manufacturing industry has been indicative of economic success (Figure 5). The manufacturing industry in Istanbul was at the top of the list in 2012, with a very concentrated workforce. Industrialization has also developed in provinces where income tax was high. Kocaeli, Bursa, Ankara, and İzmir were the four leading manufacturing provinces, following Istanbul. While Istanbul's manufacturing labor force comprised 28.9% of the national total in 2012, Bursa's share, the second highest in Turkey, was 8.2%. İzmir followed

with a 7.1% share of the national workforce, while Ankara ranked fourth, with a 5.5% share (SSI, 2012).

Istanbul, Kocaeli and Bursa constitute a region that is spatially integrated, has a concentrated manufacturing industry, and influences its surrounding provinces. İzmir and Ankara were other agglomeration regions of manufacturing industry. Sakarya and Tekirdağ comprise a region accounting for 47.3% of total national employment in the manufacturing sector in 2012. Denizli and Manisa, located on the periphery of İzmir, accounted for 11.6% of national employment in the manufacturing sector, while Eskişehir and Konya, neighboring cities of Ankara, had 9.3% of total industrial employment.

Kayseri, Adana, Kahramanmaraş, and Gaziantep are co-located in an industrial zone that accounts for 8.3% of the total industrial employment in this region. In addition, Istanbul, İzmir, and Ankara were industrial centers in 2012 (Figure 5). Within the four identified industrial regions, Istanbul and its neighbors were, and continue to be, at the forefront, while the employment in the other three industrial regions does not significantly differ from each other.

Most of the eastern and southeastern provinces had low levels of manufacturing employment (Figure 5). Çankırı, Kırıkkale, Kırşehir, Nevşehir, and Yozgat in the Central Anatolia region were also emerging as their own region that was spatially integrated with the surrounding regions, and national manufacturing industry employment shares were low (Figure 5).
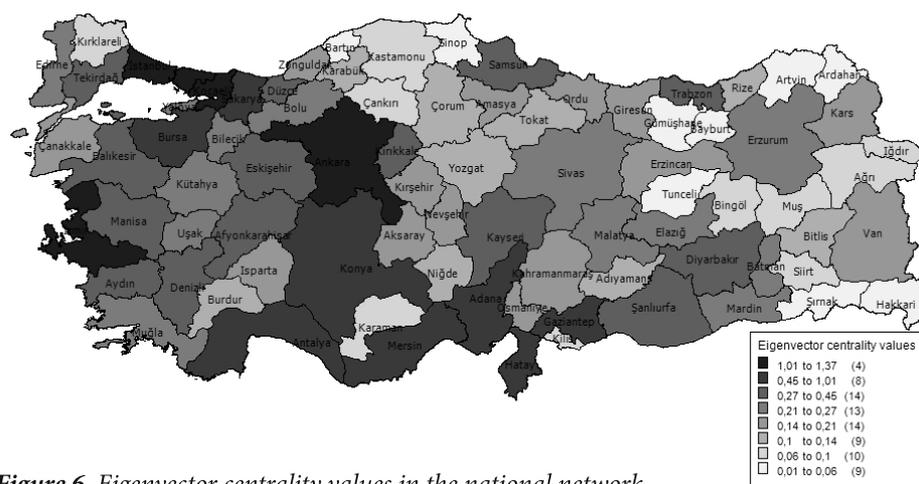
Figure 6. Eigenvector centrality values in the national network.

Figure 5 shows that aside from Gaziantep, the manufacturing industry in border provinces were less developed in 2012.

4.2.3. Centrality of provinces in national networks

In evaluating integration with the national network according to a centrality value, Istanbul, Ankara, Kocaeli, and İzmir emerged as a clear top-tier group in 2012. The second group included Sakarya, Bursa, Konya, Antalya, Mersin, Adana, Hatay, and Gaziantep (Figure 6).

Figure 6 shows that Istanbul and its surroundings, the Izmir, Ankara, and Adana region (Hatay, Gaziantep, Kayseri) and Antalya were at the forefront. Border regions east of Şanlıurfa had a low level of integration into the national network in 2012 (Figure 6). A possible reason for this is that they had very few international air transport connections, nor were there any major railway connections. However, the provinces with railroad connections were not central and decisive in the network. In other words border provinces east of Şanlıurfa were not centralized in national networks.

4.3. Modeling results

In the model, the dependent variable was provincial export capacity, while the independent variables were regional income, manufacturing industry employment, integration into the national network, and border conditions. The preferred regression method was the ordinary least squares method. By taking the logarithms of variables with positive values (> 0) over a wide range, the variance can be softened and the range of variables reduced, so that the estimators would not be significantly affected by extreme values.

The independent variables accounted for 76.1% of the change in the dependent variable. The corrected R^2 was 0.7496, and the independent variables accounted for 75.0% of the change in export capacity dependence. The model established in this study was at a statistically significant level of 0.01 (f-test: 60,13618 and p-value is 0.000 <0.01) (Table 2).

The income tax of the region had a positive effect on the variance, and had a significance of 0.01. The 1% change in the log-transformed income of the region led to an increase of 0.7296% in the log-transformed regional exports. The results of the analysis support previous literature, which asserts that foreign trade creates positive effect on economic condition (Romer, 1994, Krugman, 1991).

Manufacturing employment accounted for the growth of the industrial sector and production, with a significance of 0.01. A 1% change in the workforce labor force in the log-transformed manufacturing industry created a 0.9587% increase in regional exports. The analysis revealed that the manufacturing industry workforce had a positive effect on exports. This result can be evaluated as an expected result in accordance with the previous findings. The dependent variable, export capacity, was considered as the main mode of integration into a global network. Thus the third independent vari-

Table 2. The findings of the model.

Variable	Coefficients	Standard Error	T-ratio	Probability
C	-6.427125	1.784449	-3.601741	0.0006
Ln_Income Tax	0.729605	0.257472	2.833721	0.0059
Ln_Manufacturing Employment	0.958699	0.221605	4.326166	0.0000
Ln_Centrality in National Networks	-0.187121	0.129775	-1.441886	0.1535
Border	1.199066	0.377596	3.175524	0.0022
R-squared	0.762316			
Adjusted R-squared	0.749639			
F-statistic	60.13618			
Prob (F-statistic)	0.000000			
Durbin-Watson	2.264962			

able was provincial centrality in the national network. This variable ended up being negative and, thus, was not statistically significant.

At first glance, a significant relation between export capacity and network centrality in national networks would be expected. However, the current literature does not emphasize national networks; rather, most studies emphasize local and global networks in assessing regional economic success (Hemert et al.2013, Çavuşgil and Knight, 2015). Therefore, results of the case study do not contradict this literature. In this vein, if a region is integrated into global networks, it may prefer not to engage in competition in the national market.

The last variable in the model, the border effect, had a positive effect on export capacity and a significance level of 0.01. This variable also had the highest coefficient of variation. While the other variables were consistent with and reflected regional development, the border effect required the analysis of less developed border regions. The analysis showed that in the economic development of the border regions, increasing export capacity was an important regional development strategy.

5.Conclusion

Export analysis at the provincial level reveals that exporting provinces are located in the West and South of Turkey. There are four main export zones: the Istanbul, Izmir, Ankara, and Adana-Gaziantep regions. Without considering neighboring provinces, Istanbul alone accounted for more than half of the country's exports in 2012. Including neighboring provinces further increased Istanbul's share of national exports. Almost half of Turkey's exports originated in a large geographical region in 2012, which engendered dramatic developmental differences between Istanbul and other regions. Istanbul's export total was followed by that of metropolitan areas and their surrounding provinces.

In addition to metropolitan settlements with high export and import values, there were provinces with concentrated manufacturing as Denizli, Kayseri, and Gaziantep, and provinces at Southeast border where border trade was intense. Especially compared to their economic success, the exports of provinces at Southeastern provinces border were above Turkey's average.

These findings suggest that export capacity plays an important role in the economic success of Turkish regions. In particular, there is a positive relationship between regional income level, export capacity, and regional economic success. Moreover, the modeling results show that there is a meaningful relationship between the clustering of manufacturing industry and regional export capacity. The four prominent regions in Turkey are the four main

metropolitan areas (Istanbul, Ankara, Izmir and Adana) with their surrounding provinces. Here, exports, income, and manufacturing are concentrated.

The results also indicate that playing a central role in national networks has no significant effect on export capacity. Accordingly, it can be concluded that national networks are not as important for regional economic success as local and global networks, which is in accordance with current literature (Hemert et al. 2013). Furthermore, there is a positive significant relationship between border regions and export capacity.

Although foreign trade is expected to be relatively more developed in border provinces, where it is difficult to reach a national market, commercial agreements with neighboring countries determine the development of border trade. In addition, political and economic integration of territories separated by national borders can enable border regions to take advantage of their spatial proximity to external markets (Niebuhr and Stiller, 2004). Therefore, it will be important to develop international trade opportunities in the eastern and southeastern Anatolian and Thracian provinces.

Developing transport links and logistics centers to improve trade relations with neighboring countries, as well as improving public services in customs and free trade, will stimulate economic development by facilitating foreign trade activities within developmental nodes stated in the 'proposals for spatial organization of settlements'.

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