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The Impact of Export Diversification on Economic Growth by Provinces in Türkiye

İhracat Çeşitliliğinin Türkiye'de İller Bazında İktisadi Büyüme Üzerindeki Etkisi

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ABSTRACT

Beyond being a national measure of success, export diversification is closely linked to regional development, local employment, innovation capacity, and economic resilience. In the current study, we investigate the impact of export diversification on economic growth by provinces in the case of Türkiye for the period 2004-2018. For the purpose of the study, we employ static panel data models using Fixed Effects (FE) and Random Effects (RE) estimators, which account for unobserved heterogeneity. The findings of the study show that there is a significant negative relationship between per capita income and export intensity (HHI and GINI). In other words, as export diversification increases, per capita incomes increase. On the other hand, the coefficients obtained for the THEIL index are statistically insignificant. Therefore, it can be argued that indices measuring different dimensions of export diversification reflect different effects despite their conceptual similarities. The findings suggest that promoting export diversification can enhance regional economic growth and resilience, indicating that policymakers should prioritize strategies that encourage diversification of export portfolios, especially in underdeveloped regions, to foster balanced economic growth.

JEL Codes: F14, F43, C33

Keywords: Export Diversification, Theil Index, Gini Index, HHI, Panel Data Analysis

ÖZ

İhracat çeşitliliği, bir ulusal başarı ölçütü olmanın ötesinde, bölgesel kalkınma, yerel istihdam, inovasyon kapasitesi ve ekonomik dayanıklılıkla yakından ilişkilidir. Mevcut çalışma, ihracat çeşitliliğinin ekonomik büyüme üzerindeki etkisini 2004-2018 dönemi için Türkiye illeri örneğinde ele almaktadır. Bu amaçla, gözlenemeyen heterojenliği dikkate alan statik panel veri modelleri kullanılarak Sabit Etkiler (FE) ve Rassal Etkiler (RE) tahmincileri kullanılmıştır. Çalışmanın bulguları, kişi başına düşen gelir ile ihracat yoğunluğu (HHI ve GINI) arasında anlamlı bir negatif ilişki olduğunu göstermektedir. Diğer bir deyişle, ihracat çeşitliliği arttıkça kişi başına düşen gelirler de artmaktadır. Diğer yandan, THEIL endeksi için elde edilen katsayılar istatistiksel olarak anlamlı değildir. Bu nedenle, ihracat çeşitliliğinin farklı boyutlarını ölçen endekslerin kavramsal benzerliklerine rağmen farklı etkiler yansıttığı ifade edilebilir. Bulgular, ihracat çeşitliliğinin teşvik edilmesinin bölgesel ekonomik büyümeyi ve dayanıklılığı artırabileceğini işaret etmekte, politika yapıcıların özellikle az gelişmiş bölgelerde ihracat portföylerinin çeşitlendirilmesini teşvik eden stratejilere öncelik vermesi gerektiğini, böylece dengeli bir ekonomik büyüme sağlanabileceğini göstermektedir.

JEL Kodları: F14, F43, C33

Anahtar Kelimeler: İhracat Çeşitliliği, Theil İndeksi, Gini İndeksi, HHI, Panel Veri Analizi

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Introduction

The 21st century has witnessed significant shifts in the global economy, with increased interconnectedness and international trade. While the flow of goods, services, and capital across borders has intensified, this process has been accompanied by debates about the sustainability of globalization, rising protectionist policies, and the varying impacts on different regions (Berger, 2000; Herzog, 2014).

Globalization, especially in the last few decades, has not only transformed economic processes but has also begun to play a decisive role with its political, social and cultural dimensions (Radu, 2022). With the technological breakthroughs of the digital revolution, the relative dissolution of political borders and increased intercultural interaction, relations between economies have become more tightly networked and international economic relations have become much more complex and intertwined. This intensification is characterized by a significant increase in the volume of international trade, the dynamism of capital flows of multinational corporations and an unprecedented pace of interaction between countries, cities and even individuals (Yeung, 1998; Ahmedov, 2020). Underlying this increase in the volume of international trade is not only the flow of goods and services, but also the unrestricted movement of human capital, knowledge and innovation. On the one hand, capital flows of multinational corporations reshape countries' economic policies and foreign trade strategies; on the other hand, individuals and small-scale businesses integrate into the global economy through digital platforms. This web of interactions has necessitated the need for innovative and unique strategies for each country to determine its position in the global economy (Ghibutiu, 2013; Bereznoy, 2018).

In this context, global foreign trade trends are in constant evolution. In addition to the comparative advantages of countries, consumer preferences, technological innovations and international trade policies shape these trends. In the early 21st century, new dynamics, such as trade in services, export diversification, digital products and sustainability, have become key drivers of the global trade agenda (Cadot et al., 2011; Gnangnon, 2020, 2021; Jones & Adam, 2023).

Export diversification refers to the variety of products and target markets that make up a country's export basket and is central to countries' strategy to increase economic resilience and growth potential in a globalized world (Dennis & Shepherd, 2011). Indeed, export diversification prevents countries' economies from becoming dependent on one or a few products or markets. If exports are based on a few products or sectors, fluctuations in the international demand for these products or sectors can seriously affect the country's economy (Sangita, 2018). Moreover, promoting exports of a variety of products and services supports economic growth by providing access to new markets and a broader customer base. In addition, export diversification encourages research and development activities in different sectors, as it requires investment in different sectors. This in turn supports technological progress and innovation. Export diversification promotes development in different regions and sectors. This prevents economic activity from being concentrated only in certain regions or sectors, thus ensuring more balanced development across the country. The more diverse a country's export portfolio, the more sustainable its competitiveness in international trade. This is because dependence on a single product or sector limits the capacity to quickly adapt to changes in the global market (Nkurunziza, 2021). Export diversification can act as a buffer against external economic shocks (Cadot et al., 2013). For example, a decline in international demand for one product can be offset by other products through a diversified export structure. As a result, export diversification is a factor that supports the health, growth and sustainability of the economy. Therefore, for policymakers, promoting and supporting export diversification is an essential component of economic strategies.

Although there are many studies in the literature on the impact of exports on economic growth, the number of studies on the effects of export diversification on economic growth is quite a few. However, as summarized in Table 1, the number of studies on the importance of export diversification for economic growth has increased recently. Although there are many studies in the empirical literature that reveal the existence of a significant relationship between export diversification and economic growth (Krugman, 1979; Love, 1986; Grossman & Helpman, 1991; de Pineres & Ferrantino, 1997; Morgan & Wright, 1999; Al-Marhubi, 2000; Feenstra & Kee, 2004; Agosin, 2008; Arip et al, 2010; El Hag & El Shazly, 2012; Hamed et al., 2014; Masunda, 2020; Alshomaly & Shawaqfeh, 2020), there are also studies that find no relationship between export diversification and economic growth (Ferraira & Harrison, 2012; Haddad et al., 2013; Siddiqui, 2018; Nwosa et al.,

2019).

To summarize, in the empirical literature, the number of studies that conclude that export diversification in a country/country group has a positive effect on economic growth is quite high. On the other hand, some studies (Yakubu et al., 2022; Sadok & Nadja, 2022) show that export diversification has a negative impact on economic growth, while some others (Funke & Ruhwehel, 2005; Benli, 2020; Carrasco & Tovar-Garcia, 2020) show that there is no relationship between these variables. In addition, there are also studies that obtain conflicting results by country/country groups (Gözgör & Can, 2016).

With the acceleration of the globalization process, especially since the beginning of the 21st century, increasing internet penetration worldwide, the rise of e-commerce, the globalization of supply chains and financial integration have enabled economic activities to become borderless. This integration has not only affected national economic policies and strategies but also reshaped regional and local economic dynamics. In this new economic landscape, export diversification is no longer just a measure of national success, but has become integrated with important concepts such as regional development, local employment, innovation capacity and economic resilience. Indeed, in today's world, export diversification is a critical factor determining a region's or province's economic potential, adaptability and resilience to global shocks (Cadot et al. 2011; Oliveira et al., 2024).

Türkiye has been home to many civilizations throughout history, has a strategic geographical location where Asia and Europe meet, and has embraced a cultural diversity with this unique location. This historical and geographical richness is also reflected in Türkiye's economic structure, with different provinces having different economic characteristics and potentials. For example, some provinces excel in agricultural production, others in industrial and service production, and others in tourism or technological innovation. However, this diversity brings new opportunities and challenges with the globalization process. In a globalized world, the economic structure and export potential of each province is in constant transformation under the influence of global trends, markets and consumer preferences. This highlights the strategic importance of export diversification for each province and how this diversification should be managed on a provincial basis. This perspective shows that in order to fully utilize Türkiye's economic potential and gain an advantage in global competition, it is necessary to understand regional and local economic dynamics and to develop strategies in line with these dynamics.

The primary goal of this study is to examine the effect of export diversification on economic growth across Turkish provinces for the period 2000-2018, using a variety of product diversity indices. The study seeks to answer the following key research question: How does export diversification affect the economic growth of Turkish provinces, and to what extent do different measures of diversification (HHI, GINI, and THEIL indices) yield different insights? In this respect, the present study aims to analyze the economic importance of export diversification in detail by using province-specific export diversification data for Türkiye. This analysis will provide important insights on how Türkiye can respond more effectively to global trends while shaping its regional economic strategies.

This study contributes to the existing literature by offering a region-specific analysis of the effect of export diversification on economic growth, focusing on Turkish provinces. While much of the existing literature examines national-level export diversification, this study is among the few to analyze regional dynamics within a country. The findings show a significant negative relationship between export intensity (HHI and GINI indices) and per capita income, implying that as export diversification increases, per capita incomes rise across Turkish provinces. Socially and politically, the promotion of export diversification can reduce regional inequalities and enhance provincial economic resilience to external shocks. These findings support the need for targeted provincial-level policies to encourage diversification, particularly in underdeveloped or economically vulnerable regions.

The study is structured as follows: Following section outlines the data and methodology, including the econometric tools used. Section 3 presents the empirical results, followed by a discussion of the findings in Section 4. Finally, Section 5 concludes the study and provides policy recommendations.

Methods

In this study, we examine the effect of export diversification on economic growth using data on provinces in Türkiye. For this purpose, we use annual data on real income per capita, industrial production, agricultural production and the share of service

production in total production, public investment expenditures per capita at current prices and HHI, GINI and THEIL indices developed to calculate product diversity in exports covering the period 2004-2018. The date range selected in the study was determined according to the availability of the relevant data. GDP per capita on a provincial basis is used to represent income level, while sectoral production shares are selected as they provide information on the production structure of provinces. Since total domestic investment levels are not available for provinces, public investment variable is used to represent domestic investments. The diversity indices used in the study are calculated by the authors based on province-based export figures. In order to interpret the estimated coefficients in elasticity form, all series are included in the models in logarithmic form. Summary information on the data used in the analysis is presented in Table 1 and descriptive statistics of the series are presented in Table 2.

Table 1: *Definitions and Data Sources for the Variables Used in the Analysis*

Dependent Variable	Symbol	Definition	Data Source
Income per capita	$\mathrm{GDP_{pc}}$	GDP per capita	Turkish Statistical Institute (Turkstat)
Independent Vars.			
Export Diversification	HHI	Herfindahl-Hirschman product density index	Turkish Exporters Assembly – Authors' Calculations
	$GINI$	Gini-Hirschman product intensity index	
	$THEIL$	Theil Entropy product density index	
Industrial Production	IND	Share of industrial production in GDP	Turkstat
Agricultural Production	$AGRI$	Share of agriculture, forestry and fisheries production in GDP	Turkstat
Service Production	$SERV$	Share of service production in GDP	Turkstat
Public Investment	INV	Public Investment Expenditures per Capita by Province (Current Prices)	Presidency of the Republic of Türkiye, Presidency of Strategy and Budget

Table 2: *Descriptive Statistics*

Variables	No. Of obs.	Mean	St. Dev.	Min.	Max.	Skewness	Curtosis
GDP_{pc}	1215	16.467	10.492	2.792	78.394	1.526	6.433
HHI	1209	0.433	0.230	0	1.372	0.689	2.599
$GINI$	1209	0.570	0.185	0.217	1.282	0.569	2.424
$THEIL$	1209	1.275	0.535	0	2.804	0.589	2.812
IND	1215	0.160	0.096	0.012	0.459	0.723	2.886
$AGRI$	1215	0.153	0.732	0.001	0.394	0.321	2.932
$SERV$	1215	0.172	0.057	0.055	0.401	0.825	4.031
INV	1215	0.366	0.414	0.017	5.086	4.952	39.423
$lnGDP_{pc}$	1215	2.615	0.618	1.027	4.362	-0.028	2.463
$lnHHI$	1207	-0.986	0.574	-5.352	0.317	-0.661	5.772
$lnGINI$	1207	-0.613	0.322	-1.528	0.248	0.060	2.096
$lnTHEIL$	1207	0.150	0.460	-3.117	1.031	-0.947	6.493
$lnIND$	1215	-2.056	0.729	-4.454	-0.780	-0.782	3.348
$lnAGRI$	1215	-2.061	0.781	-6.930	-0.931	-2.944	16.075
$lnSERV$	1215	-1.812	0.334	-2.894	-0.914	-0.367	3.753
$lnINV$	1215	-1.363	0.830	-4.088	1.626	0.029	3.410

Source: Author Calculations

In the related literature, there are three indices commonly used to measure product diversification/concentration in exports. One of them, the Herfindahl-Hirschman index (HHI), is calculated by

summing the square of the shares of each good in total exports and measures the degree of concentration of exported goods for a country. In this indicator, which has values between 0 and 1, a result close to 1 indicates that the country's exports are less concentrated, while a result close to zero indicates that the product groups in the country's exports are more homogeneously distributed (Yaşar, 2021; Altun & Benli, 2021). Specifically, the HHI is calculated using formula (1).

$$H_j = \frac{\sqrt{\sum_{i=1}^{n}(\frac{X_{ij}}{X_j})^2 - \sqrt{\frac{1}{N}}}}{1-\sqrt{\frac{1}{N}}} \qquad (1)$$

Another index used to measure the export intensity of a country is the Gini-Hirschman coefficient, which measures inequality within a distribution. The index, which is calculated by a method similar to the Gini Coefficient, takes a value between 0 and 1 and shows the distribution of export revenues among products. A value of 0 represents perfect equality (where each product has equal export revenues), while a value of 1 represents perfect inequality (where one product earns all export revenues). Lower Gini-Hirschman values indicate that export revenues are distributed across a wider range of products and are more diversified (Singh, 2012; Sarıdoğan, 2021). The Gini-Hirschman coefficient is calculated as given in equation (2).

$$Gini = \sqrt{\sum_{i=1}^{n}\frac{x_{ij}}{X_j}} \qquad (2)$$

Here; n is the number of products; $\boldsymbol{x_{ij}}$ the total export value of the product $\boldsymbol{i}$ country/country group $\boldsymbol{j}$; and $\boldsymbol{X_j}$shows the total value of exports of country/country group j.

Another widely used diversity index in the literature is the Theil Entropy Index. The Theil Index is calculated by taking the logarithm of the ratio of total export revenues to the export revenues of individual products and multiplying these ratios by the share of each product in total exports. In the Theil Entropy Index, which takes values between 0 and ln(n), lower Theil values indicate that export revenues are more evenly distributed and the export structure is more diverse. As can be seen in equation (3), the number of products (n), the index value becomes smaller. In other words, assuming that other variables are assumed constant, when a new product is added to the export basket of a country/country group, export diversification increases in the country/country group analyzed (Altun & Benli, 2021).

$$Theil = \frac{1}{n}\sum_{i=1}^{n}\frac{x_{ij}}{\mu}ln(\frac{x_{ij}}{\mu}) \quad \text{ve} \quad \mu = \frac{1}{n}\sum_{i=1}^{n}x_{ij} \qquad (3)$$

Panel Data Analysis

Panel data is the aggregation of cross-sectional observations of various units such as individuals, countries, firms or households for a given period in time. This type of data includes observations of N units and T time periods. Panel data analysis is the process of testing appropriate models by integrating time series and cross-sectional analysis. There are various advantages of using panel data in econometric analysis. These advantages can be listed as follows (Gujarati, 2016):

i. Panel data offers researchers the opportunity to work on a larger data set by combining both time series and cross-sectional data. This approach minimizes the impact of trends on the analysis.
ii. Thanks to the high number of observations and increasing degrees of freedom of panel data, the correlation between explanatory variables decreases. This increases the efficiency and reliability of econometric estimations (Tatoğlu, 2012).
iii. Panel data analysis directly takes heterogeneity into account in studies on micro units such as individuals, firms, states and countries and prevents this heterogeneity from being ignored in the analysis.
iv. Effects that cannot be detected with cross-sectional or time series data alone can be measured and analyzed more effectively through panel data analysis. This increases the breadth and depth of research.

Specifically, the panel data model can be formulated as follows (Greene, 2012):

$$y_{it} = x_{it}'\beta + z_i'a + \varepsilon_{it} = x_{it}'\beta + c_i + \varepsilon_{it} \qquad (4)$$

In equation (4), "i" and "t" sub-indices denote "cross-sectional unit" and "time series unit", respectively. x_{it}, a matrix with K regressors, does not contain a constant term. Also $z_i'a$ term makes it possible to model different forms of heterogeneity or individual effects. z_i, which is the matrix containing the constant term and the set of observable or unobservable individual variables (such as gender, race, location), assumed to remain constant over time t. However, if z_i is observable (if the model contains

a constant term), the whole model can be treated as an ordinary linear model. In this ordinary linear model, a consistent and efficient estimator for the coefficients of a and β can be obtained. Therefore, the model can be written as a pooled model in the form of the regression model formulated below (Greene, 2003; Benli & Sinan, 2022).

$$y_{it} = a + x'_{it}\beta a + \varepsilon_{it}, i = 1, \dots \ , n \ ve \ t = 1, \dots \ , T_i \quad (5)$$

In this model, data from all time periods for each cross-section are grouped and stacked sequentially and estimated using a simple OLS regression. However, if c_i is unobservable, which is often the case, OLS estimates will be inaccurate and inconsistent. One of the methods that can be used to solve this problem is to adjust for unobservable effects (c_i) is a fixed effects (FE) estimator, also known as a within-group estimator, based on the assumption that it is correlated with other regressors. The FE model can be expressed in a simple form as follows (Greene, 2003; Benli & Sinan, 2022):

$$y_{it} = x'_{it}\beta + a_i + \varepsilon_{it} \quad (6)$$

Here, if X_i is stacked as temporal observations of regressors for cross-section i, $E(c_i|X_i) = h\,(X_i)$. Since the conditional mean is constant for each time period, this state model can be written as follows.

$$y_{it} = x'_{it}\beta + h(X_i) + u_{it} + [c_i - h(X_i)] = x'_{it}\beta + a_i + u_{it} + [c_i - h(X_i)] \quad (7)$$

In this model, the term$[c_i - h(X_i)]$ is not related to X_i and hence can be absorbed by the error term, and so the model can be written as in equation (8):

$$y_{it} = x'_{it}\beta + a_i + \varepsilon_{it} \quad (8)$$

This formulation turns into a classical linear model with the assumption that $Var(c_i|X_i)$ is constant (Greene, 2012; Benli & Sinan, 2022).

This model formulation is based on the assumption that cross-sectional differences a_i can be captured by changes in the constant terms. In other words, for each cross-section, a certain a_i constant needs to be estimated. However, in the context of the FE model, time-independent variables should be excluded from the model because their effects are already a_i in the estimation of the dependent variable. This means that time-invariant socio-demographic variables (e.g. race and gender) cannot be used in estimations and the partial effects of such variables on the dependent variable cannot be calculated (Greene, 2012; Benli & Sinan, 2022).

If the cross-sectional effects in the model are independent of other regressors, a modeling approach that involves randomly distributing cross-section-specific constant terms across cross-sections may be appropriate. This approach is known as the Random Effects (RE) model and can be expressed as follows:

$$y_{it} = x'_{it}\beta + (a + u_i) + \varepsilon_{it} \quad (9)$$

Here, a_i (=$E[z'_i a]$ (representing a general constant; $u_i = (z'_i a - E[z'_i a])$ is the cross-sectional random deviation of the term $z'_i a$ from its mean. The advantage of this formulation is that it significantly reduces the number of parameters to be estimated and allows parameter estimates for time-invariant variables. However, the main disadvantage of the RE model is that the estimates may be inconsistent when the assumptions about the relationship between cross-sectional effects and regressors are incorrect (Greene, 2012; Benli & Sinan, 2022).

In panel data analysis, RE estimator and FE estimator can be used together. However, it is possible to determine a priori which of the methods is better for the analysis performed, and this determination can also be made with some statistical tests. The most common of these tests is the Hausman test, which is also used in this study. The Hausman test tests whether there is a relationship between the error term and the explanatory variables. If the null hypothesis of no relationship between the error term and the explanatory variables is rejected, it can be stated that it is appropriate for the researcher to use FE.

On the contrary H_0 hypothesis can not be rejected, it would be more appropriate for the researcher to use RE (Tatoğlu, 2012).

Results

The regression results showing the relationship between export product diversity and per capita income are presented in Table 3-5, depending on the use of diversification indices in the models. Control variables are included in the regression equations one by one and different models are obtained for each table. Thus, first of all, it is aimed to reveal the possible relationship between product diversity in exports and income level and to observe whether this relationship changes when control variables are included in the model. Indeed, the disappearance of the relationship between diversification and economic growth, if any, after the inclusion of additional variables in the model would raise doubts about the strength and consistency of the relationship

between the two variables. In order to avoid the problem of multicollinearity, sectoral production shares are included singularly in the models. Moreover, based on the Hausman Test results, regression results for the appropriate FE and RE models are presented in the tables.

The regression results show that there is a statistically significant negative relationship between per capita income and HHI and GINI indices in all models. Therefore, based on the definitions of the related indices, it can be concluded that increases in product diversity in exports increase per capita incomes. On the other hand, the coefficients of THEIL index are statistically insignificant in all models. These diverging findings suggest that the HHI and GINI indices better reflect the aspects directly related to economic output in the context of the present study. The results for the THEIL index suggest that the index measures a dimension of diversity that is less directly related to income, or that it is based on the number of products (n) affects its suitability for the data set used in the current study. Indeed, these indices have their own approaches to measure export diversification. The HHI measures export concentration by summing the squares of each product's share in total exports. Lower HHI values indicate a more homogeneous distribution of exports across products and reflect a higher level of diversification. The GINI index measures the distribution of export earnings across products. Lower GINI values indicate a more balanced distribution of export revenues across a wider range of products, indicating a higher level of product diversification. In contrast, the THEIL index calculates the weighted logarithm of the ratio of individual product export revenues to total export revenues. Lower THEIL values indicate a more even distribution of export revenues and a higher level of diversification.

The Theil index is often used to measure inequality by capturing the distributional aspects of export diversification across multiple sectors. It accounts for both within-group and between-group inequalities, which allows for a more subtle view of export concentration. However, in the context of this study, the Theil index may not have shown statistical significance due to the distributional structure of exports across Turkish cities. The cities in Türkiye might exhibit relatively homogenous diversification across sectors, which limits the ability of the Theil index to capture variations that would explain differences in GDP per capita. The HHI is a concentration index that measures the size of firms (or sectors, in this case) relative to the industry, which provides an indication of export concentration. Unlike the Theil index, the HHI focuses more on the dominance of a few sectors and is a direct measure of concentration rather than inequality. Given that cities in Türkiye might have a more concentrated export structure, the HHI is more sensitive to changes in the dominant export sectors, which may explain why it shows statistical significance in the model. The GINI index measures inequality in a way similar to the Theil index but is often more intuitive and widely used. It focuses on the degree of inequality in the distribution of exports among sectors. Given that the GINI index is sensitive to the overall distribution rather than just the extremes, it can pick up on moderate levels of inequality more effectively, which may explain its significance in this study

In sum, despite their conceptual similarities, these indices reflect different dimensions of export diversification. The divergent effects of the indices on income essentially reflect the complex nature of the relationship between export diversification and economic output and emphasize the importance of considering different perspectives in analyzing such relationships.

Table 3: *Regression Results (HHI - Income Relationship)*

Variables (Dep. Var.: $lnGDP_{pc}$)	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
$lnHHI$	-0.160***	-0.065***	-0.059***	-0.073***	-0.066***
	(0.034)	(0.024)	(0.022)	(0.022)	(0.024)
$lnINV$		0.552***	0.467***	0.484***	0.551***
		(0.014)	(0.014)	(0.014)	(0.014)
$lnIND$			1.124***		
			(0.070)		
$lnAGRI$				-1.035***	
				(0.069)	
$lnSERV$					0.164
					(0.132)
$Constant$	2.459***	3.306***	5.497***	1.070***	3.601***
	(0.052)	(0.034)	(0.141)	(0.152)	(0.239)
No. of. obs.	1207	1207	1207	1207	1207
No. of Provinces	81	81	81	81	81
Hausman Test (prob.)	0.95 (0.331)	33.98 (0.000)	118.37 (0.000)	134.12 (0.000)	33.13 (0.000)
Selected Model	RE	FE	FE	FE	FE

Note: Standard errors given in parentheses. *** p<.01, ** p<.05, * p<.1

The regression results also confirm that public investment and industrial production have a statistically significant and positive effect on per capita incomes. This finding is consistent with economic theories that emphasize the role of investments and industrial development in achieving economic growth. The significant and negative coefficient obtained for agricultural production in the relevant models reflects the potential negative impact of agriculture on income. This reflects a structural aspect of the Turkish economy in which a greater emphasis on agricultural production in some provinces may be associated with lower economic output. This finding points to a lower level of productivity in agricultural production compared to other sectors.

Table 4: *Regression Results (GINI - Income Relationship)*

Variables (Dep. Var.: $lnGDP_{pc}$)	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
$lnGINI$	-0.400***	-0.165***	-0.144***	-0.176***	-0.168***
	(0.064)	(0.046)	(0.042)	(0.042)	(0.046)
$lnINV$		0.549***	0.464***	0.482***	0.548***
		(0.014)	(0.014)	(0.014)	(0.014)
$lnIND$			1.120***		
			(0.070)		
$lnAGRI$				-1.034***	
				(0.069)	
$lnSERV$					0.170
					(0.131)
$Constant$	2.371***	3.264***	5.458***	1.033***	3.907***
	(0.055)	(0.038)	(0.142)	(0.152)	(0.167)
No. of. obs.	1209	1209	1209	1209	1209
No. of Provinces	81	81	81	81	81
Hausman Test (prob.)	2.18 (0.140)	32.18 (0.000)	116.63 (0.000)	132.57 (0.000)	31.37 (0.000)
Selected Model	RE	FE	FE	FE	FE

Note: Standard errors given in parentheses. *** p<.01, ** p<.05, * p<.1

The statistically insignificant coefficient for the share of the service sector in all models indicates that the contribution of this sector to per capita incomes is not as transparent or significant as other sectors in the analyzed regions. In other words, the direct impact of the service sector on regional incomes is not evident within the framework of the existing data set and modeling. This suggests that the effects of the service sector on economic performance are more indirect or complex. It can also be interpreted that existing models do not adequately capture the diversity and dynamics of the service sector. This may also be a consequence of the need for more refined indicators of the services sector. Moreover, the statistical insignificance of the coefficient is likely to be due to the difficulties in accurately measuring the economic impact of the service sector, especially in regions where informal service activities are prevalent.

Table 5: *Regression Results (THEIL - Income Relationship)*

Variables (Dep. Var.: $lnGDP_{pc}$)	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
$lnTHEIL$	-0.005	0.022	0.001	-0.002	0.021
	(0.040)	(0.028)	(0.025)	(0.025)	(0.028)
$lnINV$		0.556***	0.470***	0.490***	0.556***
		(0.014)	(0.014)	(0.014)	(0.014)
$lnIND$			1.127***		
			(0.071)		
$lnAGRI$				-1.030***	
				(0.069)	
$lnSERV$					0.141
					(0.132)
$Constant$	2.617***	3.374***	5.566***	1.161***	3.629***
	(0.039)	((0.022)	(0.139)	(0.150)	(0.240)
No. of. obs.	1207	1207	1207	1207	1207
No. of Provinces	81	81	81	81	81
Hausman Test (prob.)	0.72 (0.396)	36.43 (0.000)	124.26 (0.000)	133.26 (0.000)	35.65 (0.000)
Selected Model	RE	FE	FE	FE	FE

Note: Standard errors given in parentheses. *** p<.01, ** p<.05, * p<.1

Conclusion and Discussion

This study reveals the impact of export product diversification on per capita income in Turkish provinces using data for the period 2004-2018 and provides important information on regional economic dynamics. Indeed, the negative relationship between per capita income and export intensity (HHI and GINI) suggests a strong link between export diversification and economic performance. The statistically insignificant effect of the THEIL index emphasizes the limited usefulness of the index in this context. While the positive impact of public investment and industrial production on economic output confirms the critical role of these sectors in regional economic growth, the findings on agricultural production raise questions about agricultural productivity. The insignificant coefficients obtained for the services sector point to sector-specific complexities.

The findings from the study emphasize the importance of policy initiatives aimed at promoting export diversification and balanced sectoral development to support regional economic development and welfare

growth in Türkiye. In this context, first and foremost, the strategic promotion of export diversification is of paramount importance. Relevant policies should be geared towards building a broader export base and should be supported by government-sponsored initiatives to increase financial incentives for market research, access to new markets and diversification of export commodities. Furthermore, a strategic allocation of resources to R&D in emerging industrial sectors is imperative. This should be complemented by the promotion of public-private partnerships to catalyze innovation and technological development. Identifying potential export products at the regional and provincial level, coupled with targeted investments in infrastructure and regional incentive programs, will also support overall economic growth. Policies to address labor shortages and encourage the use of skilled labor are also crucial. Overall, a more diverse export portfolio can reduce the current account deficit and contribute to sustainable economic growth in Türkiye.

Education programs should be aligned with the evolving needs of the industrial and technology sectors, and STEM (Science, Technology, Engineering and Mathematics) education should be prioritized to increase the capacity of the workforce to support these sectors. Relaxing regulatory frameworks to encourage entrepreneurship and innovation is also crucial, as are infrastructure investments to facilitate business activity and market expansion. The results also highlight the importance of reforming and modernizing the agricultural sector.

Given the positive relationship between export diversification and GDP per capita found in this study, policymakers should focus on policies that promote a broader mix of exports across sectors. This could involve offering incentives for industries that are underrepresented in Türkiye's export portfolio, particularly in cities that rely heavily on a few industries. This would help mitigate risks associated with market volatility and foster more stable economic growth.

A significant portion of the export potential in Turkish cities comes from small and medium-sized enterprises (SMEs). Policies aimed at supporting these enterprises, including providing access to finance, reducing bureaucratic barriers, and facilitating their integration into global supply chains, could further boost export diversification and drive economic growth.

Regional policies should be designed to reduce the disparity between more diversified, high-growth regions and those lagging behind. By targeting underdeveloped cities and offering them specific support programs—such as infrastructure development, investment in education, and fostering innovation—policymakers can ensure more balanced regional growth.

In sum, enhancing economic prosperity requires a complex approach that prioritizes diversification, modernization and innovation. Indeed, this is crucial for enhancing the resilience of Türkiye's regional economies and ensuring their sustainable development.

A notable limitation of this study is the absence of key socio-economic control variables, such as unemployment rate, education level, or human capital, at the city level. These factors are crucial elements that could influence the relationship between export diversification and economic growth. Unfortunately, consistent and reliable data for these variables are not available at the city level for the period examined (2004-2018). This limitation may affect the explanatory power of the model, as such socio-economic factors could potentially alter the dynamics between export diversification and economic outcomes.

While the main focus of this study is on the relationship between export diversification indices and GDP per capita, future research would benefit from incorporating a more comprehensive set of socio-economic indicators if data become available. These additional variables could provide a deeper understanding of the determinants of economic growth and offer more nuanced insights into regional development dynamics.

Another limitation relates to the scope of the time period covered. The analysis spans from 2004 to 2018, but it does not account for potential structural changes, global crises, or economic reforms that may have influenced export dynamics. While this study assumes that such shocks affect all cities uniformly, future work could explore the long-term effects of such events on export diversification.

Additionally, future studies could expand the analysis by investigating the impact of specific regional policies on export diversification at the provincial level. Such an approach would help in identifying policy tools that are most effective in promoting diversification and fostering economic growth.

Finally, incorporating more dynamic models, such as those that account for time-varying effects or structural breaks, could help in understanding how external shocks and policy changes influence the relationship between export diversification and growth over time.

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Genişletilmiş Özet

İhracat çeşitliliği, bir ulusun başarısının bir göstergesi olmanın ötesinde, bölgesel kalkınma, yerel istihdam, yenilik kapasitesi ve ekonomik dayanıklılıkla yakından ilişkilidir. Nitekim küresel ekonomik bağlamdaki değişimler, ekonomik stratejilerden bölgesel kalkınma ve istihdam gibi daha geniş konulara kadar bir dizi etki yaratmaktadır. Bu bağlamda, ihracat çeşitliliği, bir bölgenin veya ilin ekonomik refahını ve küresel zorluklara karşı dayanıklılığını belirleyen önemli bir faktör olarak öne çıkmaktadır. Mevcut çalışmada, Türkiye örneğinde iller bazında ihracat çeşitliliğinin ekonomik büyüme üzerindeki etkisi araştırılmaktadır.

Türkiye, tarih boyunca birçok medeniyete ev sahipliği yapmış, Asya ve Avrupa'nın buluştuğu stratejik bir coğrafi konuma sahip ve bu eşsiz konumuyla kültürel bir çeşitliliği benimsemiştir. Bu tarihi ve coğrafi zenginlik, Türkiye'nin ekonomik yapısına da yansımış, farklı illerin farklı ekonomik özellikler ve potansiyellere sahip olmasına neden olmuştur. Örneğin, bazı iller tarımsal üretimde öne çıkarken, diğerleri sanayi ve hizmet üretiminde, bazıları ise turizm veya teknolojik yeniliklerde başarılıdır. Ancak bu çeşitlilik, küreselleşme süreciyle birlikte yeni fırsatları ve zorlukları da beraberinde getirmektedir. Küreselleşen bir dünyada, her ilin ekonomik yapısı ve ihracat potansiyeli, küresel eğilimler, pazarlar ve tüketici tercihlerinin etkisiyle sürekli bir dönüşüm içindedir. Bu durum, her il için ihracat çeşitliliğinin stratejik önemini ve bu çeşitliliğin il bazında nasıl yönetilmesi gerektiğini vurgulamaktadır. Bu bakış açısı, Türkiye'nin ekonomik potansiyelini tam anlamıyla kullanabilmek ve küresel rekabette avantaj elde edebilmek için bölgesel ve yerel ekonomik dinamiklerin anlaşılmasının ve bu dinamiklere uygun stratejilerin geliştirilmesinin gerekliliğini göstermektedir.

Bu kapsamda, mevcut çalışmada, 2004-2018 dönemi için, ihracatta ürün çeşitliliğini hesaplamak amacıyla geliştirilen Herfindahl-Hirschman (HHI), Gini-Hirschman (GINI) ve Theil Entropi (THEIL) endeksleri ile kişi başına gelir, sanayi üretimi, tarımsal üretim, toplam üretimde hizmet üretiminin payı ve cari fiyatlarla kişi başına kamu yatırım harcamalarına ilişkin veriler kullanılmaktadır. Statik panel veri modelleri kullanılarak yapılan analiz bulguları, kişi başına gelir ile ihracat yoğunluğu (HHI ve GINI) arasında anlamlı ve negatif bir ilişki olduğunu göstermektedir. Diğer bir deyişle, ihracat çeşitliliği arttıkça kişi başına gelirlerin de arttığı görülmektedir. Öte yandan, THEIL endeksi için elde edilen katsayılar istatistiksel olarak anlamlı bulunmamıştır. Bu nedenle, ihracat çeşitliliğinin farklı boyutlarını ölçen endekslerin kavramsal benzerliklerine rağmen farklı etkileri yansıttığı söylenebilir. Bulgular, ihracat çeşitliliğini artırmanın bölgesel ekonomik büyümeyi ve dayanıklılığı geliştirebileceğini göstermekte ve politika yapıcıların, özellikle az gelişmiş bölgelerde dengeli bir ekonomik büyümeyi teşvik etmek amacıyla ihracat portföylerinin çeşitlendirilmesini teşvik eden stratejilere öncelik vermesi gerektiğini ortaya koymaktadır.