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DETERMINANTS OF EXPORT PRODUCT DIVERSIFICATION: EVIDENCE FROM DEVELOPING COUNTRIES[1]

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Abstract–*This study aims to identify the determinants of export product diversification in 85 developing countries over the period 2000-2022. In order to conduct a more comprehensive assessment, these countries were classified according to their geographical regions: Africa, the Americas, Asia, and Oceania. Three separate data sets were created and analyzed empirically with panel fixed effects model and random effects model. The analysis includes several independent variables that are thought to have a significant effect on export product diversification. These variables are: productive capacity index, economic growth, foreign direct investments, capital, labor force, inflation, public expenditures, and trade openness. The analysis of all countries indicates that increases in the productive capacity index, capital, labor, and public expenditures have a positive effect on export product diversification. In contrast, economic growth and trade openness have a negative effect on export product diversification. In African countries, an increase in the productive capacity index and foreign direct investment is associated with an increase in export diversification. However, public expenditures have the opposite effect, leading to a decrease in export diversification. In American countries, increases in the labor force and trade openness have a positive effect on export product diversification. Finally, in Asia and Oceania, it has been found that increases in the productive capacity index, capital, labor force, and public expenditures have led to an increase in export product diversification.*

Keywords–*Export product diversification, productive capacity index, economic growth, panel data analysis.*

İHRACAT ÜRÜN ÇEŞİTLENDİRMESİNİN BELİRLEYİCİLERİ: GELİŞMEKTE OLAN ÜLKELERDEN KANITLAR

Öz– *Bu çalışmada, 85 gelişmekte olan ülkede 2000-2022 döneminde ihracat ürün çeşitlendirmesinin belirleyicilerinin tespit edilmesi amaçlanmıştır. Ülkeler Afrika, Amerika, Asya ve Okyanusya şeklinde bölgesel olarak sınıflandırılmıştır. 3 ayrı veri seti oluşturulmuş ve panel sabit etkiler modeli ve rassal etkiler modeli ile analiz edilmiştir. İhracat ürün çeşitlendirmesi üzerinde önemli etkileri olabileceği düşünülen üretken kapasite endeksi, ekonomik büyüme, doğrudan yabancı yatırımlar, sermaye, işgücü, enflasyon, kamu harcamaları ve ticari dışa açıklık bağımsız değişken olarak analize dahil edilmiştir. Tüm ülkelerin olduğu veri setinin analizi sonucunda, üretken kapasite endeksi, sermaye, emek ve kamu harcamalarındaki artışın ihracat ürün çeşitlendirmesini olumlu yönde etkilediği tespit edilmiştir. Ekonomik büyüme ve ticari dışa açıklığın ise ihracat ürün çeşitlendirmesi üzerinde olumsuz etkilerde bulunduğu görülmüştür. Afrika ülke grubunda, üretken kapasite endeksi ve doğrudan yabancı sermaye yatırımlarındaki artışın ihracat çeşitlendirmesini artırdığı ancak kamu harcamalarını azalttığı belirlenmiştir. Amerika ülke grubunda, işgücü ve ticari dışa açıklıktaki artışın ihracat ürün çeşitlendirmesini pozitif etkilediği saptanmıştır. Son olarak Asya ve Okyanusya ülke grubunda ise üretken kapasite endeksi, sermaye, işgücü ve kamu harcamalarındaki artışın ihracat ürün çeşitliliğini artırıcı etkilerinin olduğu bulgusuna ulaşılmıştır.*

Anahtar Kelimeler *– İhracat çeşitlendirmesi, üretken kapasite endeksi, ekonomik büyüme, panel veri analizi.*

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INTRODUCTION

Classical and neoclassical economists support the idea of specialization in the production of goods with comparative advantages, assuming that this is conducive to economic growth. However, following the independence of former colonies in the period after the Second World War, the balance of power in the global market changed, and the benefits of diversification in production became more apparent. Development economists have argued that the concentration of production and exports on a few basic products brings economic risks in the form of instability in export earnings and political risks in the form of poor governance and internal conflicts. In response, they have begun to promote diversification for economic growth and development (Balawac and Pugh, 2020). In accordance with these perspectives, there have been significant changes in production trends in recent times. Countries that have achieved an increase in productivity have expanded their production possibilities by succeeding in producing high value-added goods at lower costs. Thus, they have reached higher rates of economic growth. Following the realisation of the advantages of exporting high-value-added goods, numerous countries shifted the composition of their production and exports towards more sophisticated products. In the 1980s, countries that successfully diversified and advanced their export product portfolios exhibited accelerated growth rates compared to other countries (Atasoy, 2021).

The export product diversification has been widely studied due to its positive effects on economies. Therefore, many studies have been conducted on the determinants of diversification. A review of the literature reveals that there is no consensus on the impact of these factors. At this point, the following question has been the motivation for this study: "Which fundamental factors determine export product diversification in developing countries and how do their effects differ at the regional level?". Based on this research question, the study aims to identify the factors that are thought to have a significant impact on export product diversification in developing countries. In contrast to other studies, this study aims to analyze the combined effect of various factors on a single variable by using the productive capacities index. This approach enables the inclusion of a comprehensive set of determinants of export diversification in the analysis. Furthermore, the empirical analysis was initially conducted for all 85 developing countries. Subsequently, these countries were categorized regionally and analyzed separately. Consequently, it was possible to obtain more detailed information through both general and regionally specific analyses. For these reasons, this study aims to contribute to the existing body of literature on export diversification. In order to investigate the factors influencing export product diversification, this study is structured as follows; The second section contains the theoretical background. The third section provides a summary of the relevant literature and identifies the determinants of export product diversification. The fourth section introduces the data set and econometric methodology to be employed in the empirical analysis. The fifth section reports the findings of the econometric analysis. The conclusion presents a general assessment and policy implications, which conclude the paper.

Theoretical Background

Discussions on export-led growth strategies emphasize the importance of export product composition and diversification, especially in developing countries where export product diversity is low. The diversification of products plays a vital role in the growth and development of an economy. It helps to increase factor productivity, investment and stabilize export earnings. It also provides benefits linked to macroeconomic risk mitigation and can have significant impacts on employment, poverty reduction and overall economic development. (Espoir, 2020; Berthélemy, 2005; Fonchamnyo, 2015). This can be supported by the findings in the table and graph shown below, which indicate that countries with high export product diversification are generally developed countries. The diversification of foreign trade can occur in several ways, including the diversification of exported products, the diversification of countries of trade and the diversification of trade regions. There are many definitions of export diversification in the literature. For example, according to Ali et al. (1991), export diversification is defined as the change in the current product mix exported or the number of regions exported, while Çeviker and Taş (2011) define it as the increase in the number of product types exported by countries in order to increase export revenues and ensure sustainability.

The Theil diversification index introduced by the International Monetary Fund (IMF) is one of the alternative indicators used for the export diversification variable. The Theil index shows the weighted averages of exported products in total exports. While low values of the index indicate product diversification in exports, high values indicate concentration (Çınar and Göksel 2010). Another alternative indicator for measuring export diversification is the Herfindahl-Hirschman index (HHI), also known as the export concentration index, calculated by the United Nations Conference on Trade and Development (UNCTAD) and used to estimate export diversification. It measures the extent to which a country's exports are distributed across different products or destinations. A high level of concentration indicates that the economy is overly dependent on various types of exported products or important export destinations. The HHI takes a value between 1 and 0. An HHI value close to 1 indicates that exports are concentrated on a few products. An HHI value close to 0 indicates an increased diversification of exported products (Vahalik, 2015). Among these alternatives, HHI is mostly used to determine a country's product or regional export diversification. Figure 1 presents the export product diversification levels calculated according to the HHI, in terms of regional groups.

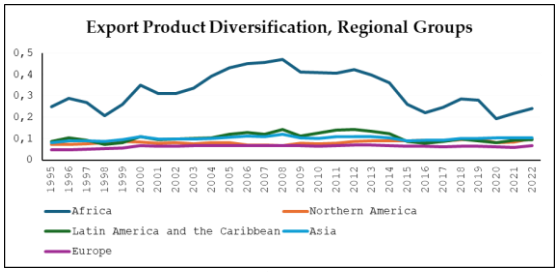

Figure 1: Export Diversification by Region.

Kaynak: UNCTAD (2024).

Figure 1 illustrates that Europe is the region with the lowest concentration index, indicating that the countries with the highest export diversification in the period 1995-2022 were located in this region. Furthermore, the North American region was found to have a higher export product diversification than other regions, except Europe, until 2014. However, the level of export diversification has decreased in recent years. For several years, North America's level of export diversification has been close to that of Asia and Latin America. The region with the lowest export diversification is Africa. The data indicates that export product diversification is significantly higher in regions with high income, which can be defined as developed countries. In addition, it is observed that export diversification is relatively low in regions with low-income countries, which are commonly referred to as underdeveloped countries. Following the regional analysis, Table 1 presents the countries with the highest and lowest levels of export product diversification on average over the period 1995-2022.

Table 1: Export Product Diversification by Country, Highest and Lowest 10 Countries

Countries	1995	2000	2005	2010	2015	2020	2021	2022	Average
Italy	0.055	0.055	0.054	0.052	0.052	0.058	0.053	0.076	0.055
Austria	0.061	0.086	0.072	0.059	0.061	0.065	0.064	0.068	0.066
Poland	0.080	0.077	0.081	0.077	0.065	0.063	0.062	0.057	0.073
Denmark	0.067	0.078	0.081	0.072	0.075	0.087	0.080	0.077	0.074
France	0.059	0.076	0.082	0.088	0.098	0.080	0.068	0.066	0.081
Turkiye	0.111	0.098	0.091	0.074	0.072	0.064	0.060	0.061	0.086
USA	0.075	0.091	0.090	0.082	0.097	0.083	0.083	0.096	0.087
Thailand	0.090	0.108	0.086	0.086	0.076	0.084	0.078	0.075	0.087
Portugal	0.104	0.105	0.082	0.075	0.078	0.073	0.068	0.076	0.090
Netherlands	0.053	0.138	0.101	0.112	0.082	0.073	0.077	0.105	0.094
Congo	0.782	0.776	0.790	0.725	0.561	0.620	0.577	0.602	0.712
Equatorial Guinea	0.447	0.800	0.920	0.738	0.672	0.725	0.642	0.588	0.724
Marshall Islands	0.498	0.524	0.865	0.831	0.754	0.788	0.890	0.918	0.733
Guinea-Bissau	0.501	0.585	0.842	0.834	0.836	0.851	0.855	0.854	0.751
Botswana	0.706	0.594	0.793	0.608	0.798	0.871	0.889	0.790	0.752
Libya	0.763	0.763	0.827	0.752	0.617	0.658	0.810	0.759	0.764
Chad	0.713	0.740	0.730	0.852	0.853	0.693	0.681	0.686	0.784
Nigeria	0.854	0.923	0.880	0.802	0.757	0.751	0.762	0.704	0.827
Angola	0.892	0.878	0.951	0.945	0.921	0.864	0.819	0.836	0.904
Iraq	0.722	0.974	0.949	0.947	0.968	0.820	0.904	0.907	0.931

Source: UNCTAD (2024)

Table 1 indicates that, on average, Italy has the lowest concentration index value and thus the highest export product diversification. It is also observed that other countries with high export diversification are generally high-income countries, i.e. developed countries. However, it is noteworthy that Turkey and Thailand are among the 10 countries with the highest export product diversification despite being a middle-income developing country. In this respect, there is an exceptional situation. The country with the lowest export product diversification is Iraq. In addition, other countries with low export product diversification include middle-income and low-income developing countries. Based on this information, it can be said that the export product diversification of high-income developed countries is high, while the export product diversification of developing countries is low.

Literature Review

In the related literature, a number of variables have been examined as affecting export product diversification, including GDP per capita, fixed capital investments, human capital, economic growth, openness, infrastructure, political stability, the labor force, natural resources, geographical location, and FDI (Foreign Direct Investment). Panel data analysis methods are employed to explain the relationship between variables empirically. In this context, the Generalized Method of Moments (GMM) approach is frequently used. It is observed that the results obtained vary according to the country and time period under investigation. A summary of some of the studies on this subject can be found in Table 2.

Table 2: Literature Review

Author(s)	Period/ Country	Variables	Methods	Results
Dependent Variable: Export Diversification (ED)				
Alemu (2008)	1975-2004/ 32 Sub-Saharan African Countries	Real GDP per capita, FDI, Physical and Human Capital, Infrastructure Quality, Inflation, Exchange Rate, Trade Openness, Political Stability, Aid, Labor and Natural Resources.	Feasible General Least Square (FGLS)	An increase in real GDP per capita, human capital, health, real GDP per capita, labor force, infrastructure quality, aid, trade openness, arable land and FDI increases export product diversification. However, an increase in the oil dummy variable included in the natural resource variable decreases export product diversification. The effects of increases in physical capital and political stability vary.
Jayawe era (2009)	1990-2006/ 26 Low Income Countries	Nominal Exchange Rate, GDP, Trade Agreements and FDI.	Fixed and Random Effects Model	An increase in GDP, trade agreements and FDI increases export product diversification. An increase in the nominal exchange rate

				decreases export diversification.
Agosin et al. (2012)	1962-2000/ Countries	Trade Openness, Human Capital, Terms of Trade, Financial Development, Exchange Rate Volatility, Real Exchange Rate, Economic Distance, GDP per capita	GMM	Trade openness and financial economic distance decrease export product diversification. No significant effect of other variables was found.
Alaya (2012)	1984-2009/ 12 MENA Countries	GDP Per Capita, FDI, Domestic Investment, Exchange Rate, Natural Resources, Fuel Exports, Trade Openness, High Technology Product Exports and Democracy.	Fixed Effects Model	Increases in GDP per capita, trade openness, domestic investment, exchange rate, FDI and democracy increase export product diversification. Natural resource and oil exports decrease export diversification. Exports of high-tech products have no effect.
Iwamoto and Nabeshima (2012)	1980-2007/ 175 Countries	GDP Per Capita, Population, Inflation and Trade Openness	GMM	A rise in population and foreign direct investment (FDI) results in an expansion of export product diversity. Conversely, an increase in inflation has the opposite effect. The variable representing trade openness was found to have no significant effect.
Kamuganga (2012)	1995-2009/ Africa Countries	Trade Agreements, Exports, Governance Index, Exchange Rate Volatility, Financial Development, Cost of Doing Business, Distance, Product Experience, Tariff and Market Experience.	Fixed Effects Model	Exchange rate volatility, financial development, governance index, cost of doing business, exports, trade agreements and FDI increase export product diversification. Product and market experience decreases.
Arawomo et al. (2014)	1980-2012/ Nigeria	GDP Per Capita, Domestic Investment, Exchange Rate, Natural Resources, Democracy, Trade Openness and FDI.	GMM	The increase in exchange rates, the development of democracy, and the increase in foreign direct investment (FDI) have been observed to result in a decrease in export diversification. Conversely, domestic investment tends to increase. Nevertheless, changes in trade openness, natural resources, and GDP per capita have no significant impact on export product diversification
Elhiraika and Mbate (2014)	1995-2011/ 53 Africa Countries	GDP Per Capita, Public Investment, Population Growth, Human Capital, Infrastructure, Exchange Rate, Terms of Trade, Public Efficiency, Location, Private Sector Investment, Financial Development	GMM	The expansion of GDP per capita, population growth, infrastructure, human capital and private sector investments facilitates export diversification. Conversely, the terms of trade tend to have the opposite effect.
Longmore et al. (2014)	1980-2011/ 183 Countries	Trade Openness, Financial Development, Population, Human Capital, Institutional Quality, Exchange Rate, Inflation, FDI, Terms of Trade, Domestic Investment and GDP per Capita	GMM	Financial development, real exchange rate volatility, and FDI increase export product diversification. An increase in the terms of trade decreases export product diversification. Other variables do not have any significant effect
Can and Köseka hyaoğlu (2016)	1995-2015/ 16 Developing Countries	FDI, Human Capital, Openness, Fixed Capital Investment, GDP, Distance to Market, Infrastructure and Geographical Location	Panel Pooled OLS, Unit Effects Model and Time Effects Model	Increases in human capital, trade openness, GDP, geographical location and FDI increase export product diversification. Increases in fixed capital investments, distance to market and infrastructure have a decreasing effect.
Ali (2017)	1996-2011/ 130 Countries	GDP per capita, Population, Trade Openness, Human Capital, Exchange Rate and FDI.	GMM	The expansion in the range of exported products is associated with an increase in GDP per capita, exchange rate, and FDI. Conversely, a negative effect on this phenomenon is observed in relation to population, trade openness, and human capital.
Osakwe et al. (2018)	1970-2010/ Developing and Sub-Saharan African Countries	Total Trade, Tariffs, GDP per Capita, Human Capital, Distance, Infrastructure, Institutional Quality	Panel OLS	An increase in GDP per capita and a decrease in distance are associated with a reduction in export diversification.
Hounsou and Ayivodji (2020)	1990-2015/ 14 Countries in the Frank Region	Human Capital, GDP per capita, Financial Freedom, Trade Openness, Fixed Capital Investment, Democracy Index, FDI, Terms of Trade and Inflation.	LSDV	All explanatory variables except FDI increase export diversification. FDI, on the other hand, has no significant effect.
Ibrahim et al. (2020)	1986-2014/ 23 Sub-Saharan African Country	Quality of Government, Democracy, Government Stability, GDP per capita, FDI, Trade Openness and Total Resource Rent.	ARDL	Democracy, government stability, trade openness and an increase in FDI increase export product diversification. Government quality and aggregate resource rent have a negative effect.
Li et al. (2021)	2004-2016/ 30 Provinces of China	FDI, Industrial Value Added/GDP, Human Capital, Public Expenditures, Financial Development, Location and R&D Expenditures	Panel OLS	An increase in FDI increases export product diversification. Increases in industrialization, human capital, location and R&D expenditures decrease it. Public expenditures and financial development have no effect.
Yaşar (2021)	2005-2019/ Developed and Developing Countries	R&D Expenditures, Ease of Doing Business, Human Development Index, Natural Resources, Trademark Applications, Population, Trade Openness, FDI, Real Effective Exchange Rate and Import Concentration Index.	GMM	Increases in R&D expenditures, ease of doing business, human development index, population and FDI increase export product diversification. On the other hand, GDP per capita, natural resource rent, brand, exchange rate and import concentration variables negatively affect export product diversification. The trade openness variable has no significant effect.
Gulguu (2022)	1996-2018/ Developing Countries	Population, Institutional Quality, Human Capital, GDP per capita and FDI.	GMM	An increase in the number of locations and foreign direct investment (FDI) has a negative effect on export product diversification. An increase in GDP per capita, population, human capital and institutional quality is

				associated with an increase in this variable.
Swathi and Sridharan (2022)	1995-2019/ 43 High Income, 47 Middle Income and 11 Low Income Countries	Human Capital, GDP per capita, Population, Trade Openness, Industry/GDP, Agriculture/GDP, FDI and Exchange Rate	Fractional Logit Model	Rises in human capital, GDP per capita, population, trade openness, and industry/GDP, as well as increases in FDI, lead to export diversification. Conversely, growth in agriculture/GDP and fluctuations in exchange rates have the opposite effect.
Harighi et al. (2023)	2005-2018/ 54 Developing Countries	Financial Development, Exchange Rate, FDI, Fixed Capital Investment and Trade Openness.	GMM	Increases in financial development, exchange rates, trade openness and FDI increase export product diversification.
Ngassam (2023)	2000-2014/ 37 African Countries	Infrastructure, Natural Resource Rent, Democracy, GDP per capita, Trade Openness, FDI, Globalization, Corruption and Financial Development.	GMM	An increase in infrastructure, GDP per capita, trade openness, financial development and FDI is associated with an expansion in the range of export products. The presence of natural resource rents, democracy and globalisation is associated with a reduction in export product diversification. The corruption variable was found to have no significant effect.

Note: ARDL: Autoregressive Distributed Lags; FGLS: Feasible Generalised Least Square; LSDV: Least-squares Dummy Variable.

This study differs from other studies in the literature in two points. Thus, it contributes to the literature. First, the countries in the panel are classified regionally. This classification is not very common in the literature. Second, the productive capacity index is selected as the independent variable. There are relatively few studies examining the effect of the productive capacity index on export product diversification. In the light of this information, the main hypotheses of the study were determined as follows:
Hypothesis 1: The effects of the determinants of export diversification differ regionally.
Hypothesis 2: Productive capacities index has a positive effect on export diversification.

Data and Econometric Method

This study employs annual data from 2000 to 2022 to analyze the determinants of export diversification in 85 developing countries, as identified by the United Nations (UN) classification. In addition to the data set comprising all countries, an empirical analysis of the determinants of export diversification from a regional perspective was conducted using data sets containing 32 African countries, 18 American countries, and 35 Asian and Oceanian countries. Country and period selection was made depending on the availability of data. The list of country sets is presented in the table in the Appendix. This regional classification was conducted by the United Nations. The variables utilized in this study are described in Table 3, which is presented.

Table 3: Explanations of Variables

Variables	Explanations	Source
ED	Herfindahl-Hirschman Endeksi (HHI)	UNCTAD
PCI	Productive Capacities Index (Averages of Natural Capital, Human Capital, Transport, Energy, Institutions, Information and Communication Technology, Structural Change Sub-Categories and Private Sector	UNCTAD
GROWTH	GDP growth (annual %)	World Bank
FDI	Foreign direct investment, net inflows (% of GDP)	World Bank
CAPİTAL	Gross fixed capital formation (% of GDP)	World Bank
LABOR	Labor force participation rate, total (% of total population ages 15+) (modeled ILO estimate)	World Bank
INFLATION	Inflation, GDP deflator (annual %)	World Bank
GOVEXP	General government final consumption expenditure (% of GDP)	World Bank
TRADE	Trade (% of GDP)	World Bank

The econometric model, constructed in accordance with the given information, is as follows:

$$ED = \beta_0 + \beta_1 PCI_t + \beta_2 GROWTH_t + \beta_2 FDI_t + \beta_2 CAPİTAL_t + \beta_2 LABOR_t + \beta_2 INFLATION_t + \beta_2 GOVEXP_t + \beta_2 TRADE + e_t \quad (1)$$

In equation (1), t is the time and et error term. Static panel data analysis was chosen as econometric analysis. Given that the cross-sectional dimension of the data is greater than the time dimension, this method is preferable in that it avoids the spurious regression problem. In the analysis, the presence of unit effects was initially investigated with the F test and LR (Likelihood Ratio) tests. Subsequently, the Hausman (1978) specification test was employed to determine the appropriate model for estimation, namely the fixed effects model or the random effects model. Finally, coefficient estimates are generated using robust estimators for four different models (all countries, Africa, America, Asia and Oceania) based on four different data sets.

Findings

The results of the unit effect and time effect tests for the validity of the classical regression model for the four models, which consist of regional groups and the all country set, are presented in Table 4.

Table 4: Unit and Time Effect Test Results

	F Test		LR Test	
	Unit Effect	**Time Effect**	**Unit Effect**	**Time Effect**
General	156.27 (0.000)	1.16 (0.273)	3457.94 (0.000)	0.00 (1.000)
Africa	134.82 (0.000)	1.04 (0.416)	1229.44 (0.000)	0.00 (1.000)

Americas	77.69 (0.000)	0.95 (0.535)	509.81 (0.000)	0.00 (1.000)
Asia and Oceania	177.75 (0.000)	2.12 (0.002)	1448.28 (0.000)	0.00 (1.000)

Note: 1) In the F test, which tests the validity of the classical model against the fixed effects model, a probability value of 0.10 and below means the rejection of the H_0 hypothesis that all unit effects are equal to zero, that is, the classical model is correct. 2) In the LR (Likelihood Ratio) test, which tests the validity of the classical model against the fixed effects model, a probability value of 0.10 and below means the rejection of the H_0 hypothesis that the classical model is correct.

Table 4 presents the results of the F test, which assesses the validity of the classical model in comparison to the fixed effects model. The results indicate that a unit effect is present in all four models. Nevertheless, it was observed that there was no time effect in the other three models, with the exception of Asia and Oceania. The LR test, which assesses the validity of the classical model in comparison to the random effects model, indicates that a unit effect is present in all models, while a time effect is absent in all of them. The findings indicate that the classical model is not an appropriate methodology for coefficient estimation. Therefore, either a fixed or random effects model should be employed. In order to determine the most appropriate model for the given context, a Hausman (1978) specification test was conducted, the results of which are presented in Table 5 below.

Table 5: Hausman Test Results

	χ^2 statistic	Probability
General	25.05	0.002
Africa	19.39	0.013
Americas	2.75	0.949
Asia and Oceania	24.06	0.002

Note: In this test, the null hypothesis (H_0) is "there is no correlation between explanatory variables and unit effect" and the alternative hypothesis (H_a) is "there is a correlation between the explanatory variables and the unit effect". If the probability value is less than 0.05, the alternative hypothesis is accepted and it is decided to estimate the coefficient with the fixed effects model. If it is greater than 0.05 H_0 hypothesis is accepted and it is decided to use the random effects model (Yerdelen Tatoğlu 2013:179-182).

In light of the results presented in Table 5, it can be concluded that the random effects model should be employed for the purpose of making estimation for the America region. Conversely, the fixed effects model should be used for Africa, Asia, and Oceania, as well as for all country sets. However, the problems of heteroskedasticity, autocorrelation and, cross-sectional dependence, which may pose obstacles to efficient estimates, were investigated beforehand. The results of the tests conducted for this purpose are presented in Table 6.

Table 6: Diagnostic Test Result

	Heteroskedasity		Autocorrelation		Cross-Section Dependence
	Breusch and Pagan LM Test	**Modified Wald Test**	**Durbin-Watson Test**	**Baltagi-Wu (LBI) Test**	**Pesaran CD Test**
General	-	1.10 (0.000)	0.551	0.700	6.555 (0.000)
Africa		8044.71 (0.000)	0.684	0.846	6.518 (0.000)
Americas	2487.10 (0.000)	-	0.543	0.649	1.142 (0.253)
Asia and Oceania	-	73516.50 (0.000)	0.529	0.682	3.837 (0.000)

Note: Tablodaki *** ve ** sırasıyla 1% ve 5% önem düzeyinde eş bütünleşme vektörü bulunduğunu ifade etmektedir. Note: 1) Breusch and Pagan LM Test in the random effects model χ^2. When the probability value obtained according to the statistic is less than 0.10, it means that the null hypothesis H_0, which indicates that the variance of the unit effects is equal to zero, is rejected and it is accepted that there is varying variance. 2) If the probability value calculated according to the Modified Wald Test statistic within the scope of the fixed effects model is less than 0.10, the null hypothesis H_0 that variances are homoskedatic across units is rejected and it is accepted that there is a changing variance situation. 3) Although the Durbin-Watson test and Baltagi- Wu (LBI) local best invariant test values are not critical values in the literature, it is interpreted that there is autocorrelation if they are less than 2 but not if they are greater than 2. 4) A Pesaran CD test probability value less than 0.10 means that the null hypothesis H_0 that there is no cross-section dependence (cross-section dependence) is accepted, but a larger value means that there is cross-section dependence.

According to the diagnostic test results, all three problems of heteroskedasticity, autocorrelation and cross-section dependence were found to exist in the model consisting of all country groups, the model consisting of countries in Africa and the model consisting of countries in Asia and Oceania. However, in the model consisting of the countries in the Americas, while the presence of heteroskedasticity and autocorrelation was found, there was no evidence of cross-section dependence. Based on this information, it is determined that it is appropriate to make coefficient estimates with Driscoll-Kraay, which is a robust estimator within the scope of one-way fixed effects model for the other three country groups other than the Americas. For the model consisting of the countries in the Americas, it was decided to estimate the coefficients with the Arellano-Bond, Froot and Rogers robust estimator within the scope of one-way random effects model. The results obtained for the coefficient estimation results are given in Table 7.

Table 7: Coefficient Estimation Results

Variables	All Countries	Africa	Americas	Asia and Oceania
PCI	-0.219*** (0.000)	-0.193** (0.034)	0.011 (0.979)	-0.254*** (0.000)
GROWTH	0.061** (0.027)	0.063 (0.225)	-0.004 (0.957)	0.025 (0.606)
FDI	-0.068 (0.186)	-0.180*** (0.010)	-0.455 (0.687)	0.068 (0.347)
CAPITAL	-0.067** (0.046)	-0.040 (0.515)	0.045 (0.737)	-0.158** (0.028)
LABOR	-0.154* (0.055)	0.150 (0.425)	0.425** (0.042)	-0.664*** (0.000)
INFLATION	0.004** (0.048)	0.004 (0.114)	0.100 (0.188)	-0.033 (0.453)
GOVEXP	-0.150*** (0.001)	0.177** (0.037)	-0.047 (0.943)	-0.735*** (0.000)
TRADE	0.026** (0.037)	0.024 (0.483)	0.116* (0.086)	0.008 (0.462)
Constant	55.529*** (0.000)	35.449** (0.016)	-5.010 (0.804)	99.470*** (0.000)

The results of the estimation process indicate that the Productive Capacity Index (PCI) is the variable that has the strongest impact on export diversification across all countries. The effect of the PCI variable is negative in direction. Accordingly, an increase of one unit in the PCI variable decreases the product concentration index by 0.219 units. Given that a decrease in the product concentration index implies an increase in export product diversification, an increase in the Productive Capacity Index increases export product diversification. Apart from the variable CAPITAL, which represents the ratio of gross fixed capital stock to GDP, the variables LABOR, which represents the labor force ratio, and GOVEXP, which represents the ratio of general government final consumption expenditure to GDP, are also found to have negative and significant effects on the dependent variable. In other words, an increase in these variables increases export product diversification. The variables GROWTH, INFLATION and TRADE, which represent economic growth, inflation rate and trade openness, respectively, are found to have positive and significant effects on the dependent variable. In other words, an increase in these variables decreases export product diversification. Finally, the FDI variable, which is the ratio of net foreign direct investment inflows to GDP, has no significant effect on export product diversification.

When the coefficient estimates of the model consisting of African countries are analyzed, it is determined that the most effective variable on export diversification is PCI and the direction of its effect is negative. Accordingly, one-unit increase in PCI decreases the product concentration index by 0.193 units. This means that an increase in PCI increases export product diversification. Similarly, the FDI variable has a negative and significant effect on the dependent variable. The GOVEXP variable is found to have a positive and significant effect on the dependent variable. However, GROWTH, CAPITAL, LABOR, INFLATION and TRADE variables have no significant effect.

A statistical analysis of the coefficient estimates for the model consisting of American countries reveals that only the variables LABOR and TRADE have a statistically significant effect on the dependent variable. Moreover, the direction of these effects is positive. Accordingly, an increase in LABOR and TRADE variables decreases export product diversification. The other variables do not have any significant effect.

Upon analysis of the coefficient estimates of the model comprising Asian and Oceania countries, it was observed that the most effective variable on export diversification was GOVEXP. Accordingly, a 1 percent increase in the GOVEXP variable decreases the product concentration index by 0.735 units. In addition, PCI, CAPITAL and LABOR variables are also found to have negative and significant effects on the dependent variable. Accordingly, an increase in these variables increases export product diversification. However, no significant effect of other variables on the dependent variable was found. The results reveals that the effects of the determinants of export diversification differ regionally and that the productive capacities index has a positive effect. These results imply that the main hypotheses of the study are valid.

CONCLUSION

The objective of this study is to determine the impact of a number of independent variables, as determined by a review of the literature on export product diversification. In this context, an empirical analysis was conducted by selecting a period according to the availability of data in developing country groups. The results of the panel data analysis indicate that the Productive Capacity Index, a variable comprising numerous variables and not previously utilized in the literature, is associated with increased export product diversification in country groups other than the Americas. The specific characteristics of country groups contribute to the generation of these disparate outcomes. It is evident that each country or country group possesses distinctive geographical characteristics, population structures, human capital, technology, and economic structures. Considering that the Productive Capacity Index is explained by a combination of human capital, natural resources, energy, information and communication technologies, institutions, private sector, transportation and structural changes, this result is in line with expectations. Accordingly, an increase in the index may increase and diversify the total amount of production due to the increase in human capital, the emergence of technological developments, the development of private sector activities, and the inclusion of institutions. Furthermore, this may lead to an increase in the diversity of export products. Productive capacities foresee the full use of resources. It supports diversification and structural transformation for inclusive growth and development. Therefore, it is important for policy makers to keep productive capacities at the forefront of development tools. Economic growth, on the other hand, is not found to be effective in country groups classified by regions, except for the model in which all developing countries are considered together. When evaluated for all countries, the fact that economic growth reduces export product diversification means that export diversification may decrease as a result of the concentration of production factors in the production of certain products. Because whatever is produced intensively in a country will be exported. The insights of Alemu (2008) may also prove valuable in explaining this phenomenon. He posits that as countries achieve specific growth rates and attain a certain level of per capita income, diversification may diminish, leading to a shift in focus towards the production of select products. Thus, in the process of economic growth, export diversification may decrease depending on the income level of the country. For this reason, domestic production should be diversified in order to diversify exports. FDI is found to be effective only in African countries and increases export product diversification. As Gamariel et al. (2022) argue, in this group of countries, FDI diversifies the production capacity and export structure of countries through the transfer of skills, innovation and knowledge. Policymakers should encourage foreign investors to be export-oriented.

The model, which includes all countries and Asian and Oceanian countries, indicates that gross fixed capital investments contribute to export product diversification. It can be posited that, as previously stated by Ben Hammouda

et al. (2006), an increase in fixed capital investments in these country groups will result in an expansion of industrial production, thereby diversifying the product structure. The increase in investments is important as it will lead to new technologies and competition. Labor is found to be an effective factor in country groups outside of Africa, and to increase export product diversification. Jetter and Hassan (2012) provide an explanation for this phenomenon. The presence of a larger labor force allows for the use of a greater number of factors of production in the production of diversified products, which in turn positively affects export product diversification. For this reason, policies that will make labor qualified should be followed. The impact of inflation on export product diversification is only significant in a model that includes all countries. In accordance with the existing literature, inflation is found to reduce export product diversification. As Alemu (2008) points out, in a high inflation environment with macroeconomic instability, it is difficult to accurately forecast costs and profits. It is important for countries to implement a healthy monetary policy. Consequently, new investments and the emergence of new sectors may become impossible. This reduces the diversification of manufactured products and negatively affects export product diversification. Government expenditures have been found to positively affect export product diversification except for countries in the Americas. As stated by Elhiraika and Mbate (2014), the export diversification enhancing effect of government expenditures is possible through the emergence of new sectors and the development of infrastructure. It can therefore be posited that in those countries where the beneficial impact is observed, the expansion of government spending facilitates the production and export of new products through the positive effects it has on economic activity. Government expenditures are an important policy tool used for high value-added sectors. Finally, the trade openness variable was found to have a significant effect on export product diversification in the sample of all countries and in the countries of the Americas. In these country groups, trade openness reduces export product diversification. As posited by Ferdous (2011) in Ali (2017), the underlying cause may lie in the fact that countries tend to concentrate on trade in goods where they have a comparative advantage. Trade openness should be a priority to encourage greater specialization.

Consequently, in the context of the developing countries under consideration, the enhancement of productive capacity in the economy plays a crucial role in export product diversification. In this context, the advancement of human capital, physical capital, information and communication technologies, infrastructure, institutional quality, foreign direct investments, and labor quantity will be of significant importance in enhancing productive capacity and export product diversification. In addition to all these, it is crucial for the public sector to make effective expenditures in line with the established targets. This will facilitate the diversification of exports and the improvement of the aforementioned determinants.

Finally, the most important limitation of this study is that it covers a specific period. If older data is available, obtaining longer series that provide retrospective or future estimates will make the research more comprehensive.

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EXTENDED ABSTRACT

The export product diversification has been widely studied due to its positive effects on economies. Therefore, many studies have been conducted on the determinants of diversification. A review of the literature reveals that there is no consensus on the impact of these factors. The objective of this study is to identify the factors that are thought to have a significant impact on export product diversification in developing countries. In contrast to other studies, this study aims to analyze the combined effect of various factors on a single variable by using the productive capacities index. In the related literature, a number of variables have been examined as affecting export product diversification, including GDP per capita, fixed capital investments, human capital, economic growth, openness, infrastructure, political stability, the labor force, natural resources, geographical location, and FDI (Foreign Direct Investment). Panel data analysis methods are employed to explain the relationship between variables empirically. In this context, the Generalized Method of Moments (GMM) approach is frequently used. It is observed that the results obtained vary according to the country and time period under investigation. This study employs annual data from 2000 to 2022 to analyze the determinants of export diversification in 85 developing countries, as identified by the United Nations (UN) classification. In addition to the data set comprising all countries, an empirical analysis of the determinants of export diversification from a regional perspective was conducted using data sets containing 32 African countries, 18 American countries, and 35 Asian and Oceanian countries. The list of country sets is presented in the table in the Appendix. This regional classification was conducted by the United Nations. Static panel data analysis was chosen as econometric analysis. Given that the cross-sectional dimension of the data is greater than the time dimension, this method is preferable in that it avoids the spurious regression problem. In the analysis, the presence of unit effects was initially investigated with the F test and LR (Likelihood Ratio) tests. Subsequently, the Hausman (1978) specification test was employed to determine the appropriate model for estimation, namely the fixed effects model or the random effects model. Finally, coefficient estimates are generated using robust estimators for four different models (all countries, Africa, America, Asia and Oceania) based on four different data sets. The results of the unit effect and time effect tests for the validity of the classical regression model for the four models, which consist of regional groups and the all country set, are presented. The results indicate that a unit effect is present in all four models. Nevertheless, it was observed that there was no time effect in the other three models, with the exception of Asia and Oceania. The LR test, which assesses the validity of the classical model in comparison to the random effects model, indicates that a unit effect is present in all models, while a time effect is absent in all of them. The findings indicate that the classical model is not an appropriate methodology for coefficient estimation. Therefore, either a fixed or random effects model should be employed. In order to determine the most appropriate model for the given context, a Hausman (1978) specification test was conducted. It can be concluded that the random effects model should be employed for the purpose of making estimation for the America region. Conversely, the fixed effects model should be used for Africa, Asia, and Oceania, as well as for all country sets. However, the problems of heteroskedasticity, autocorrelation and, cross-sectional dependence, which may pose obstacles to efficient estimates, were investigated beforehand. According to the diagnostic test results, all three problems of heteroskedasticity, autocorrelation and cross-section dependence were found to exist in the model consisting of all country groups, the model consisting of countries in Africa and the model consisting of countries in Asia and Oceania. However, in the model consisting of the countries in the Americas, while the presence of heteroskedasticity and autocorrelation was found, there was no evidence of cross-section dependence. Based on this information, it is determined that it is appropriate to make coefficient estimates with Driscoll-Kraay, which is a robust estimator within the scope of one-way fixed effects model for the other three country groups other than the Americas. For the model consisting of the countries in the Americas, it was decided to estimate the coefficients with the Arellano-Bond, Froot and Rogers robust estimator within the scope of one-way random effects model. Consequently, in the context of the developing countries under consideration, the enhancement of productive capacity in the economy plays a crucial role in export product diversification. In this context, the advancement of human capital, physical capital, information and communication technologies, infrastructure, institutional quality, foreign direct investments, and labor quantity will be of significant importance in enhancing productive capacity and export product diversification. In addition to all these, it is crucial for the public sector to make effective expenditures in line with the established targets. This will facilitate the diversification of exports and the improvement of the aforementioned determinants.