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EXPORT DIVERSIFICATION AND GROWTH: A BOOTSTRAP PANEL CAUSALITY ANALYSIS FOR SELECTED EMERGING MARKET ECONOMIES

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ABSTRACT

In the present study, the relationship between economic growth and export diversification was examined for 10 emerging market economies. For this purpose, the panel data analysis was performed by using the data of period between 1968 and 2014. Within the scope of this analysis, the cross-sectional dependence test and the panel bootstrap causality test developed by Konya (2006) were implemented. According to the results of empirical analyses, it was determined that there was a unidirectional causality relationship from economic growth to export diversification only in Indonesia. Moreover, it was also found that there was a unidirectional causality relationship from export diversification to economic growth in Argentina, Columbia, India, Malaysia, and Turkey. However, no causality relationship was found for other countries. These results reveal the importance of adopting the policies improving the product diversification by promoting the manufacturers in emerging market economies.

Key Words: *Emerging Market Economies, Export Diversification, Growth, Panel Boostrap Causality.*

Jel Codes: *O10, F10, N70.*

İHRACAT ÇEŞİTLENDİRMESİ VE BÜYÜME: SEÇİLMİŞ YÜKSELEN PİYASA EKONOMİLERİ İÇİN PANEL BOOSTRAP NEDENSELLİK TESTİ

ÖZET

Bu çalışmada, seçilmiş 10 yükselen piyasa ekonomisi için ihracat çeşitlendirmesi ve ekonomik büyüme arasındaki ilişki incelenmiştir. Bu amaçla 1968-2014 dönemi verileri kullanılarak panel veri analizi gerçekleştirilmiştir. Analiz kapsamında, yatay kesit bağımlılığı testi ve Konya (2006) tarafından

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geliştirilen panel bootstrap nedensellik testi uygulanmıştır. Ampirik analiz sonuçlarına göre, sadece Endonezya'da ekonomik büyümeden ihracat çeşitliliğine doğru tek yönlü nedensellik ilişkisi olduğu görülmüştür. Ayrıca Arjantin, Kolombiya, Hindistan, Malezya ve Türkiye'de ihracat çeşitliliğinden ekonomik büyümeye doğru tek yönlü bir nedensellik ilişkisinin olduğu bulgusuna da ulaşılmıştır. Ancak diğer ülkelerde herhangi bir nedensellik ilişkisine rastlanılamamıştır. Bu sonuçlar, yükselen piyasa ekonomilerinde üreticilerin teşvik edilerek ürün çeşitliliğini artırıcı politikalarının benimsenmesinin önemini ortaya koymaktadır.

Anahtar Kelimeler: *Yükselen Pyasa Ekonomileri, İhracat Çeşitliliği, Büyüme, Panel Boostrap Nedensellik.*

Jel Kodları: *O10, F10, N70.*

1. INTRODUCTION

As a result of the changes in sources of economic growth and the transformation of countries from autarchic trade to a liberal structure, the export-oriented growth policies gained more importance. From this aspect, the relationship between economic growth and export is one of the subjects frequently discussed in studies carried out on economic growth. As one of the sources of economic growth, marketing the surplus products by means of the export activities provides the country with the foreign exchange inflow. For the continuance of foreign exchange inflows achieved as export revenues, the export activities should show continuity. On the other hand, the export revenues may decrease because of various factors such as exporting easy-to-substitute goods with high elasticity of demand such as basic foodstuff, increasing transportation costs due to long geographical distance between the countries, exporting limited number of goods, and having trade relationship with limited number of countries. For the countries adopting the export-oriented growth model, this inconsistent structure of export revenues makes the economy vulnerable.

Besides the export-oriented economic growth model in the conventional development models, the transition from exporting primary goods to exporting diversified goods plays an important role in order for the economic growth to be sustainable and consistent (Agosin, 2007: 23). Given the country-specific political and geographical risks in addition to the market risks arising from the increasing competition brought by globalization, it can be stated that especially the developing countries can reduce these risks, which they may face with, by making use of export diversification in order to achieve a stable structure in foreign trade.

The main purpose of present study is to reveal the relationship between export diversification and economic growth in emerging market economies that were selected. The present study consists of 5 sections. In the second section, the theoretical and empirical literature on export diversification and economic growth is summarized. In the third section, the dataset and econometric method are presented,

whereas the results of empirical analysis are discussed in fourth section. In the conclusion section, a general evaluation is carried out. It is aimed to contribute to the literature on relationship between export range and economic growth from both econometric method and selected set of countries.

2. EXPORT DIVERSITY AND ECONOMIC GROWTH

Export diversification can occur in different forms such as diversifying the goods being exported, diversifying the foreign trade partner countries, and diversifying the trace regions. In literature, there are many definitions of export range. For instance, according to Ali et al. (1991), the export diversification is described as changing the actual mix of products being exported or the number of countries, to which the export is made. On the other hand, Çeviker and Taş (2011) described this concept as increasing the range of export goods in order to ensure the increase and continuity of export revenues. Samen (2010) defined the export diversification as the process of transition from exporting the conventional goods to exporting the non-conventional goods. According to Imbs and Wacziarg (2003), the export diversification may occur as a result of an increasing domestic demand to various products in addition to the increase in income level.

Regarding the process of export diversification, it was reported that the export product component has rapidly diversified but the concentration replaced the diversification when a certain level of income was achieved (Parteka and Tamberi, 2013). The threshold value for transition from diversification to concentration was reported to be $22,500 (calculated with the prices of base year 2000) in analyses of Klinger and Lederman (2006) and $25,000 (calculated with the prices of base year 2005) in analyses of Cadot et al. (2011).

In addition to its contributions to the growth of a country's economy, adopting the export diversification is accepted to have many positive aspects. Increasing the diversity of export goods contributes to the increase in exports on one hand and it may also help the export revenues with gaining stability on the other hand. Increasing the number of products in the basket of export goods may contribute to the emergence of new industries and the increase of production in existing industries. Moreover, the countries adopting the export diversification may also benefit from the growth trends in different industries of global economy. Since specializing especially in exporting the primary goods makes the countries vulnerable to shocks, price fluctuations, and decreases in international terms of trade, these risks can be minimized by making use of diversification (Kaplan and Tur 2017:59-74; Misztal, 2011:55-64; Alexander and Warwick, 2017:177-194; Singer, 1950:473-485).

Besides these positive aspects, there is also a point to be considered in diversification. The allocation of financial sources to specific industries by the governments may not enable fully achieving the diversification. However, in the developed countries having robust financial structure, the markets influenced by the risks at lower levels make it possible to specialize in exports. This suggests that the

development levels play an effective role in diversification or specialization policies (Acemoğlu and Zilibotti, 1997:709-751; Chang, 1991:261).

Some of the studies empirically analyzing the relationship between export diversity and economic growth under the light of theoretical information are presented and summarized in Table 1.

Table 1. Summary of Literature on Economic Growth and Export Diversification

Author/Year	Country/Period	Method	Conclusion
Pifieres and Ferrantino (1995)	Chile/1962-1991	LSM	A negative relationship was found between economic growth and product diversification. It was reported that the diversification increased in economic recession periods.
Agosin (2007)	Eastern Asia and Latin American Countries /1980-2003	Panel OLS	Product diversification in export positively contributes to the economic growth.
Bacchetta et al. (2007)	191 Developed and Developing Countries /1985-2004	Panel Regression Analysis	As the income level of countries increases, the export diversification decreases.
Hesse (2008)	99 Countries/1961-2000	Solow Growth Estimation Model with GMM Method	Export diversification positively contributes to the income per capita.
Parteka and Tamberi (2008),	60 Countries /1985-2014	OLS	A positive relationship was found between the level of income per capita and the product diversification in export.
Aditya and Roy (2009)	65 Countries /1965-2005	GMM	Product diversification in export positively contributes to the economic growth.
Değer (2010)	Turkey/1980-2006	Johansen Cointegration, Correlation Analysis, Granger Causality	A unilateral causality relationship from product diversification in export to GDP was found.
Cadot et al. (2011),	156 Countries /1988-2009		It was determined that, in countries having income per capita less than $24,000, the level of diversification is lower.
Çeviker and Taş (2011)	Turkey/1962-2008	Granger Causality	Although there is no direct causality relationship between economic growth and product diversification, unilateral causality relationships from economic growth to export and from export to product diversification were reported and it was also reported that economic growth indirectly influences the product diversification.
Matadeen (2011)	Mauritius/1980-2008	Johansen Cointegration, VECM	Product diversification in export positively contributes to the economic growth.
Fotros et al. (2013)	24 Developing Countries /2000-2009	GMM	The income per capita increases by 0.27% when export diversification increases by 1%.
Hamed et al. (2014)	23 Developing Countries /2000-2009	GMM	Product diversification in export positively contributes to the economic growth.

Mudenda et al. (2014)	South Africa/1980-2010	VECM	Product diversification in export positively contributes to the economic growth.
Acaravcı and Kargı (2015)	Turkey/1995-2012	ARDL-Granger Causality	No significant causality relationship was found between GDP and product diversification in exports.
Can and Kösekahyaoğlu (2016),	16 Developing Countries / 1995-2010	Panel LSM	GDP positively affects the product diversification.
Lugeiyamu (2016)	50 African Countries /1998-2009	OLS and GMM	A positive relationship was found between product diversification in export and increase in income per capita.
Lotfi and Karim (2017)	Morocco / 1980-2015	Johansen Cointegration, Vector Error Correction Model (VECM)	It was estimated that the increase in Hirschman Concentration Index (HHI) by 0.1% would contribute to economic growth by 0.6%, 0.9%, and 1.2%, respectively, in first 3 years, and that 1 unit increase in Theil index would contribute to economic growth by 0.12%, 0.17%, and 1%, respectively, in first 3 years.
Mclntyre et al. (2018)	34 Small Countries /1990-2018	Panel Regression Analysis	The product diversification in export reduces the uncertainties at the level of aggregate output and positively contributes to the economic growth.

Given the summaries of empirical studies on the relationship between economic growth and product diversification in export (presented in Table 1), it can be seen that different methods were used in analyzing the data of many countries. However, in the previous studies, this subject has been discussed less for Turkey's data. Considering that Turkey adopts the export-oriented growth model and gives significant importance to the export revenues in parallel with Objectives 2023, the product diversification in export is a subject that should be considered for Turkey and other emerging economies. Since the concentration of free foreign trade together with the liberalization increased the interaction between countries and led them affect each other, the studies on foreign trade should take these effects of countries on each other into consideration. For these reasons, the relationships between the variables were analyzed using panel data analysis for the emerging economies including Turkey.

3. DATASET AND ECONOMETRIC METHOD

In order to test the relationship between export diversification and economic growth in 10 selected emerging market economies[1], the annual data of period between 1968 and 2014 was used in the present study. Annual economic growth rates were used in representing the economic growth (GROWTH), and the series were obtained from World Bank. In representing the variable "export diversification" (DIV), the Theil diversification index data, details of which are presented below and which were obtained from IMF (International Monetary Fund), were used;

[1] 10 Selected Emerging Markets: Argentina, Brazil, China, Colombia, India, Indonesia, Malaysia, Mexico, South Africa and Turkey.

$$Theil = \sum_{i=1}^{N} P_i log(1/P_i) \quad (1)$$

$P_i = x_i / X$;

x_i = export of product i

X = Total export

N= Total number of products exported

In the formula above, P_i refers to the share of product i in total export. Similarly, total product diversification is found through the Theil index by calculating the shares of every product in the total export. Theil index yields the weighted averages of exported goods in total exports. Lower values of index indicate the product diversification in export, whereas the higher values indicate the concentration (Çınar and Göksel, 2010: 38).

In the present study, firstly, the dependence between the cross-sectional units, which is the only precondition, constituting the panel was examined, because the time series characteristics are not necessary for using the bootstrap panel causality test as in unit root test or cointegration test. For this purpose, the Langrange Multiplier ($CDLM_1$) test developed by Breusch and Pagan (1980), $CDLM_2$ test developed by Pesaran (2004), and $CDLM_{adj}$ test developed by Pesaran et al. (2008) were applied. Then, depending on the results of cross-sectional dependence test, the panel bootstrap causality test developed by Konya (2006) was implemented and the analysis was ended.

3.1. Cross-sectional Dependence Test

In testing the cross-sectional dependence, Breusch-Pagan's (1980) $CDLM_1$ test, Pesaran's (2004) $CDLM_2$ test, Pesaran's (2004) $CDLM$ test, and Pesaran et al.'s (2008) $CDLM_{adj}$ test are used in literature. The cross-sectional dependence can be detected by using $CDLM_1$ and $CDLM_2$ when T>N, using $CDLM$ test when N>T, and using $CDLM_{adj}$ test when T>N and N>T. The first contribution to cross-sectional dependence was made by Moran (1948). Then, as an alternative approach, Breusch and Pagan (1980) developed the LM statistics;

$$CDLM_1 = T\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}^2, \quad (2)$$

$\hat{\rho}_{ij}$ refers to the estimation of pair-wise correlation of residuals,

$$\hat{\rho}_{ij} = \hat{\rho}_{ji} = \frac{\sum_{t=1}^{T} e_{it}e_{jt}}{\left(\sum_{t=1}^{T} e_{it}^2\right)^{1/2}\left(\sum_{t=1}^{T} e_{jt}^2\right)^{1/2}} \quad (3)$$

is the estimation of $e_{it=y_{it}-\hat{\beta}_i' x_{it}}$ and u_{it} by using Least Squares Method (LSM). LM test does not have a specific prerequisite for cross-sectional units and it can be used when T> N. But, this test was improved and $CDLM_2$ test that can be used when both of cross-section size and time dimension are large was developed;

$$CDLM_2 = \sqrt{\frac{2}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} (T\hat{\rho}_{ij}^2 - 1) \quad (4)$$

In this test, when T→∞ and N→∞, cross-sectional independence is tested in accordance with the null hypothesis (Pesaran, 2004: 6-7). Moreover, by making a correction in LM statistics, Pesaran et al. (2008) developed $CDLM_{adj}$ test that can be used also when N>T;

$$CDLM_{adj} = \sqrt{\frac{2}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \left[\hat{\rho}_{ij}^2 \left(\frac{(T-k)\hat{\rho}_{ij}^2 - \mu_{Tij}}{v_{Tij}} \right) \right] \sim N(0,1)(12) \quad (5)$$

In this equation, μ_{Tij} refers to the mean and v_{Tij} to the variance. This test called bias-adjusted $CDLM$ ($CDLM_{adj}$) is capable of estimating the cross-sectional dependence without any sample bias when N>T and T>N. Hypothesis tests are;

H_0: There is no cross-sectional dependence.

H_a: There is cross-sectional dependence. (Pesaran et al., 2008:1-4).

3.2. Konya (2006) Panel Bootstrap Causality Test

Developed by Konya (2006), the panel data approach is based on seemingly unrelated regressions (SUR) and Wald statistics including the country-specific bootstrap critical values. This approach has two main advantages. First, it does not require joint hypotheses for all the cross-sectional units constituting the panel. It allows contemporaneous correlation between the cross-sectional units and enables the use of extra information provided by the panel data. Second, it does not require any pretest, except for the optimal lag structure. According to this approach, the equations (6) and (7) below are estimated:

$$y_{1,t} = \alpha_{1,1} + \sum_{l=1}^{mly_1} \beta_{1,1,l} y_{1,t-1} + \sum_{l=1}^{mlx_1} \gamma_{1,1,l} x_{1,t-1} + \varepsilon_{1,1,t}$$

$$y_{2,t} = \alpha_{1,2} + \sum_{l=1}^{mly_1} \beta_{1,2,l} y_{2,t-1} + \sum_{l=1}^{mlx_1} \gamma_{1,2,l} x_{1,t-1} + \varepsilon_{1,2,t}$$

.

$$y_{N,t} = \alpha_{1,N} + \sum_{l=1}^{mly_1} \beta_{1,N,l} y_{N,t-1} + \sum_{l=1}^{mlx_1} \gamma_{1,N,l} x_{1,t-1} + \varepsilon_{1,N,t} \quad (6)$$

and

$$x_{1,t} = \alpha_{2,1} + \sum_{l=1}^{mly_2} \beta_{2,1,l} y_{1,t-1} + \sum_{l=1}^{mlx_2} \gamma_{2,1,l} x_{1,t-1} + \varepsilon_{2,1,t}$$

$$x_{2,t} = \alpha_{2,2} + \sum_{l=1}^{mly_2} \beta_{2,2,l} y_{2,t-1} + \sum_{l=1}^{mlx_2} \gamma_{2,2,l} x_{2,t-1} + \varepsilon_{2,2,t}$$

..

$$x_{N,t} = \alpha_{2,N} + \sum_{l=1}^{mly_2} \beta_{2,N,l} y_{N,t-1} + \sum_{l=1}^{mlx_2} \gamma_{2,N,l} x_{N,t-1} + \varepsilon_{2,N,t} \quad (7)$$

In these equations, y and x refer to variables, *i* to countries (i=1,…,N), *t* to period (t=1,…,T), and *l* the lag. $\varepsilon_{1,1,t}, \varepsilon_{1,2,t}, \varepsilon_{2,1,t},$ and $\varepsilon_{2,2,t}$ are considered as white-noise error terms. This alternative specification has two distinctive characteristics. First, the equations (6) and (7) have different and predetermined variables. Since the only possible relationship between the individual regressions is the contemporaneous correlation, these equation sets refer to SUR systems, not VAR. Second, since the country-specific bootstrap critical values are used, there is no need for analyzing the characteristics of time series such as unit root test or cointegration test. It is not assumed that y_t and x_t variables must be stationary. According to the SUR system here, there is a unidirectional Granger causality relationship from X to Y in country *i* if all $\gamma_{1,i}$ values in Equation (6) are not zero but all $\beta_{2,i}$ values in Equation (7) are zero. If all $\gamma_{1,i}$ values in Equation (6) are zero but all $\beta_{2,i}$ values are not zero, then there is a unidirectional Granger causality relationship from Y to X in country *i*. Moreover, if neither $\beta_{2,i}$ nor $\gamma_{1,i}$ values are zero, then there is a bidirectional causality relationship between variables X and Y. However, if all $\beta_{2,i}$ and all $\gamma_{1,i}$ values are zero, then it can be stated that there is no causality relationship between X and Y (Konya, 2006:979-981).

Since the results of causality relationship depend critically on the lag structure in this approach, the lag length must be determined before the estimation. There is no simple rule to decide on the maximum number of lags. However, in the present test, it is accepted that the optimal lag length to minimize the Akaike Information Criterion and Schwartz Criterion is 1-4 (Konya, 2006:982). In conclusion, according to this test, the Wald statistics are compared to the critical values, which are obtained for each cross-sectional unit by using bootstrap method, in order to determine the causality relationship. When it was determined that Wald statistics is higher than bootstrap critical value for any cross-sectional unit, then it can be stated that there is a causality relationship between the variables. Otherwise, if the Wald statistics is lower than the bootstrap critical value, then there is no causality relationship.

4. EMPIRICAL RESULTS

The cross-sectional dependence was investigated by using $CDLM_1$ test developed by Breusch-Pagan (1980), $CDLM_2$ test developed by Pesaran (2004), and $CDLM_{adj}$ test developed by Pesaran et al. (2008). The test results are presented in Table 2.

Table 2. Cross-Sectional Dependence Test Results

	Model 1		**Model 2**	
	Test Statistics	**Prob.**	**Test Statistics**	**Prob.**
$CDLM_1$	177.331***	0.000	65.893**	0.023
$CDLM_2$	13.949***	0.000	2.202**	0.014
$CDLM_{adj}$	2.487***	0.006	8.329***	0.000

Note: ***, **, and * refer to the presence of cross-sectional dependence at significance levels of 1%, 5%, and 10%, respectively. Export diversity is dependent variable in Model 1 and economic growth in Model 2.

In Model 1, the null hypothesis referring to the cross-sectional independence is rejected at the significance level of 1% in all the tests. In Model 2, the null hypothesis referring to the cross-sectional dependence is rejected at a significance level of 1% in $CDLM_{adj}$ test and 5% in $CDLM_1$ and $CDLM_2$ tests. In conclusion, it was determined that there is cross-sectional dependence in Model 1 and Model 2.

The results of panel bootstrap causality test developed by Konya (2006) in order to determine the causality relationship between export diversity and economic growth are presented in Tables 3 and 4.

Table 3. Bootstrap Causality Test Results (Model 1)

		Bootstrap Critical Values		
Countries	**Wald Stats.**	**1%**	**5%**	**10%**
Argentina	1.101	20.855	13.051	9.600
Brazil	0.138	10.387	5.806	3.933
China	1.412	15.740	8.394	5.819
Colombia	0.740	13.277	7.380	5.024
India	3.002	12.497	6.711	4.718
Indonesia	3.816*	9.549	5.163	3.583
Malaysia	1.532	8.335	4.679	3.189
Mexico	1.514	11.272	6.309	4.302
South Africa	2.556	15.361	8.685	5.843
Turkey	0.750	13.918	7.764	5.412

Note: ***, **, and * indicate that the null hypothesis is rejected at a significance level of 1%, 5%, and 10%, respectively. The bootstrap critical values is derived from 10,000 replications.

According to the results of analysis applied for Model 1, in which export diversification is dependent variable and economic growth is the explanatory variable, presented in Table 3, the causality relationship from economic growth to export diversity was found only in Indonesia among 10 emerging market economies. In 9 countries other than Indonesia, no causality relationship from economic growth to export diversity could be found.

Table 4. Bootstrap Causality Test Results (Model 2)

		Bootstrap Critical Values		
Countries	**Wald Stats.**	**1%**	**5%**	**10%**
Argentina	16.037***	14.451	8.050	5.656
Brazil	0.218	9.189	5.106	3.569
China	0.688	11.238	6.292	4.344
Colombia	7.616**	12.276	6.272	4.373
India	5.389*	12.557	6.745	4.740
Indonesia	0.593	10.076	5.578	3.868
Malaysia	10.022**	11.131	5.855	4.009
Mexico	0.033	11.300	6.304	4.501
South Africa	0.238	11.312	6.215	4.193
Turkey	7.635**	10.800	6.033	4.155

Note: ***, **, and * indicate that the null hypothesis is rejected at a significance level of 1%, 5%, and 10%, respectively. The bootstrap critical values is derived from 10,000 replications.

According to the results of analysis performed for Model 2, in which the economic growth is dependent variable and the export diversification is explanatory variable, presented in Table 4, it was determined that the causality relationship from export diversification to economic growth was found in Argentina, Colombia, India, Malaysia, and Turkey. In resting 5 countries, no causality relationship from export diversity to economic growth could be found.

5. CONCLUSION

In the present study, the relationship between export diversity and economic growth in 10 selected emerging market economies for the period between 1968 and 2014 was examined by using bootstrap causality test developed by Konya (2006) and allowing the analysis by considering cross-sectional dependence. First, at the end of cross-sectional dependence test, it was determined that there is cross-sectional dependence between the countries constituting the panel. In other words, it was found that a shock occurring in any country due to export diversity or economic growth would affect the other countries. The results of panel bootstrap causality test considering the cross-sectional dependence indicate that there is a one-way causality relationship from economic growth to export diversification in Indonesia. Moreover, it can also be seen that there is a one-way relationship from export diversification to economic growth in Argentina, Colombia, India, Malaysia, and Turkey. However, it was also found that there was no causal relationship between export diversification and economic growth in Brazil, China, Mexico, and South Africa.

The cross-sectional dependence between the countries analyzed in the present study limits the unilateral trade behaviors or countries and thus it causes the organization of politic relationships, as well as the trade relationships. The fact that a causality relationship from export diversification to the economic growth was found reveals the importance of an export policy based on the diversity in order to ensure the economic growth. Thus, the export structure of countries will be able to project the growth rates of countries in the future.

Since it was determined that there is an important relationship between economic performance and export diversification, it was became necessary to promote the manufacturer companies and to follow the policies increasing the product diversity. It is important to separately investigate the potentials of each industry and to prioritize the ones having higher potential to develop while exploring the new industries. Moreover, determining the current conditions in international markets, detailing the marketing studies in high-profitability areas, revealing the risks specific to the trade-partner countries, and establishing the holistic strategies would contribute to export diversification and thus to sustainable economic growth.

Besides the studies carried out on the relationship between export diversification and economic growth, the microeconomic studies carried out at the level of companies, which may influence the diversification, are believed to contribute to the literature. Moreover, some of the other subjects to be studied are which type of products the diversity increases in and the shares that the technology-intensive or labor-intensive products have from the export diversification.

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