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Is the Export-Led Growth Model Valid in Emerging Economies? The Role of Intellectual Capital

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In recent years, emerging economies have been considered a new growth engine of the global economy. This study tests the export-led growth hypothesis with a sample of 31 emerging economies. Unlike other studies, in this research, intellectual capital is used as a variable affecting economic growth. The database for the study covers the period 1992–2019 and is divided into two sub-samples and two sub-periods. The study's results make some notable contributions to the current literature. First, they confirm the export-led growth hypothesis in these economies. This empirical finding is the first evidence of this with the largest sample of emerging economies, filling an empirical research gap in the contemporary literature. Second, intellectual capital is found to have a positive impact on economic growth both directly and indirectly, in upper-middle-income countries. However, the positive effect of this variable is not confirmed in the lower-middle-income group. Third, education is considered a key factor supporting economic growth based on all estimated results. Conversely, pollution and poverty have a negative influence on economic growth in most study samples. Lastly, we derive some policy implications for improving economic growth in these emerging economies in the future.

Keywords: *Export-Led Growth Model; Intellectual Capital; Intellectual Property; Emerging Economies.*

Introduction

Debates on economic growth and its driving forces are prominent in the economic literature (Solow, 2016; Chen *et al.*, 2020; Bista & Sheridan, 2021). Economic growth and the factors of growth are the main subjects of economic theories (Jorgenson & Vu, 2016; Mania & Riebe, 2019; Nouira & Saafi, 2021). Generally, the growth rate of an economy is affected by several factors, and exports are considered a key factor supporting economic growth. International trade is linking countries more closely than ever before (Bista & Sheridan, 2021). In recent decades, developing countries have implemented an important economic growth policy, known as the export-led growth model. The importance of the international trade and export sector in enhancing economic growth has been underlined in both theoretical and empirical research (Alcala & Ciccone, 2004; Singh, 2010; Mania & Riebe, 2019; Ghazouani *et al.*, 2021). However, the export-led growth model also has received some criticisms because it can expose countries to international economic crises (e.g. Palley, 2011; Harvie & Lee, 2003).

In the context of globalisation, the growth of the global economy has been considerably subordinated to the growth rates of some developed countries (Mokyr *et al.*, 2015). However, in recent years, emerging economies have been regarded as a new engine of global economic growth given their significant contributions to economic output and employment worldwide (Ward, 2009). The term 'emerging economies' is popularly understood to refer to developing countries that are undergoing a rapid growth trend and possess some characteristics of a developed market but do not currently fully meet its standards (Sharma, 2014). Statistics indicate that emerging economies are important for driving the growth momentum in their areas and the world economy (Sharma, 2014; Bostan *et al*., 2022; Tung & Hoang, 2023). Based on the sizeable contributions of these countries to global growth (estimated to represent one-quarter to one-half of global growth), emerging economies are expected to be a major determinant of global prosperity in the near future (Johnson, 2008). Besides their high economic growth rates, several reasons explain why emerging economies have been prioritised by foreign investors (Johnson, 2008). For example, they have highly dynamic markets, diverse business environments, huge domestic demands, young population structures and large middle-income classes (Ward, 2009). Yet, the question remains of why many emerging economies grow so fast and so durably. Therefore, estimating the sources of economic growth in emerging markets is of relevance not only for academics but also to policymakers. Interest in emerging economies is widespread in investment practices and the market-analysis business, but it is not reflected in the academic literature. A popular characteristic of emerging economies is that they have tried to open their markets as much as possible to join global trade through international value chains. The export sectors of these economies are expanding significantly, which highlights the important role of export activities in supporting economic growth.

However, there are concerns that the export-led growth model cannot offer a prosperous path to emerging economies. Specifically, the argument is this development strategy is good for economic growth but cannot help a fast-growing economy successfully overcome the middle-income trap; this is an economic development situation in which a country faces an income trap because of particular

disadvantages, achieving and becoming stuck at a particular income level (Otsuka *et al.,* 2017). Some fast-growth countries have failed to break out of the middle-income trap to join the group of developed countries and thus remain categorised as developing countries. Avoiding the middle-income trap entails applying intellectual capital strategies to introduce new processes, new products and new supply chains and find new markets to maintain the momentum of economic growth (Radosevic & Yoruk, 2017; Habanik *et al.,* 2019). Intellectual capital is crucial for raising the purchasing power of innovative products, providing high-quality services and helping drive growth. Therefore, debates over the role of intellectual capital and its performance in the growth equation have recently become an issue of interest (Sharma & Dharni, 2017). Intellectual capital and its application are expected to be essential catalysts for economic growth in emerging economies. Furthermore, the greatest challenge in escaping this trap is in switching from cheap resource-driven growth to growth based on high productivity and innovation processes (Lentjushenkova & Titko, 2017; Tung & Binh, 2022), making intellectual capital an important factor for future economic growth in emerging economies (Kozak, 2013; Jednak *et al.,* 2017).

To the best of our knowledge, few studies have examined the export-led growth model in emerging economies while considering intellectual capital as a driving factor of the economic growth equation (Bostan *et al.,* 2022). In addition, most previous results relied on old databases and inhomogeneity. Hence, the reference values for the policy-making process are quite limited. In light of this, this paper makes several contributions. First, it examines whether exports improve economic growth based on a large sample of emerging economies. The empirical evidence helps to fill the current gap in the literature on economic growth. Second, by adding intellectual capital to the estimated equations, we provide the first evidence of the role of intellectual capital as an independent variable in the export-led growth model. Third, we include other independent variables (i.e. education, pollution and poverty) in the estimation process, which can provide valuable information to the leaders of these countries for increasing the efficiency of the policy-making process. By dividing the sample into two sub-periods and two sub-panel samples, we obtain results that are quite diverse and valuable references for the academic field. Furthermore, for this study, we collected an annual database from the World Development Indicators (World Bank, 2021a) covering the period 1992–2019, which is considered the most up-to-date among available data sources.

This paper is divided into five sections. Section 2 presents a literature review on the topic at hand. Section 3 describes the methodology and data sources for the study. The quantitative results and discussions are laid out in Section 4. Finally, Section 5 provides a conclusion to the study.

Literature Review

Exports and export activities have been considered the main engine in improving economic growth (Berrill, 1960; Darrat, 1987; Fosu, 1990; Dornbusch, 1992; Boltho, 1996; Greenaway et al., 1999). In recent decades, many countries have merged trade strategies forward outside with their development strategies (Krueger, 1980; Gibson & Ward, 1992; Edwards, 1998). The impact of exports on economic growth has been conceptualised into a popular theoretical framework for development, the export-led growth model (Balassa, 1978; Krueger, 1980; Dodaro, 1991). Previous research has examined the export-led growth hypothesis in developed countries (e.g. Harvie & Lee, 2003; Tang *et al.,* 2015), developing countries (e.g. Reza *et al.,* 2018; Adedoyin *et al.,* 2022) or less-income countries (e.g. Biyase & Zwane, 2014). In addition, some studies have focused on emerging economies with a high growth rate or dynamic business markets, such as Agrawal (2015), Rani and Kumar (2018) and Liu et al. (2019) for the four countries in the Brazil, Russia, India and China (BRIC) group or Tang et al. (2015) for the Asian dragon countries.

Furthermore, some researchers have argued that the export-led growth model is effective in supporting growth but insufficient for developing countries to achieve prosperity, especially in the case of emerging economies. In the contemporary economic literature, sources of competitive edge, which help sustainable growth, have shifted from traditional resources to intellectual ones. In a new economic platform, intellectual capital is regarded as a prominent resource for enhancing growth and generating wealth as well as strongly improving economic performance and powering advanced business markets. Consequently, intellectual capital and its use are considered essential catalysts for the economic model in emerging economies in the future. Therefore, in this review of previous findings, we only discuss recent empirical works that use intellectual capital as an independent variable in the export-led growth testing equation related to emerging economies.

In an empirical study, Harvie and Lee (2003) analysed South Korea's development strategy, which has helped the country reach remarkable economic achievements by transforming from a poverty-ridden into a newly industrialised nation. This economic transformation was based on the adoption of an outward-oriented strategy (i.e. an export-led growth model). In addition, South Korea developed large-scale industrial conglomerates and pursued economies of scale and technology to achieve international competitiveness. The successful economic development strategy of South Korea is informative for other developing countries.

Ma (2008) identified Taiwan's development strategy in previous decades. In the early stages of Taiwan's economic development, the strategy relied on increasing overall factor productivity by reallocating resources from the less productive sectors to the more productive ones. This strategy employs intellectual capital to help achieve the goal of reaching global markets through the exploitation of comparative advantage. In this regard, Jimenez and Razmi (2013) discussed knowledge spill-overs, technology transfer and the adoption of new management techniques that can support economic growth. Additionally, the growth rate of an economy may also be a function of the proportion of a country's manufactured exports destined for these countries. The empirical evidence shows that intellectual capital (denoted by industry value added in the gross domestic product [GDP]) has a positive and significant effect on economic growth. Kozak (2013) noted that

intellectual capital, which includes intangible resources and hidden capabilities, considers as the potential development of countries and regions. Therefore, intellectual capital can be seen as a success factor that affects national socio-economic development. In some Latin American and Caribbean economies, Kristjanpoller et al. (2016) investigated whether the higher economic growth can be explained by commodity export activities since the 2000s. Their study demonstrated that manufacturing exports had a positive effect on economic growth, which implies that the interaction between export and intellectual capital can help further enhance economic growth.

Using a different study sample, Jednak et al. (2017) explored how knowledge and intellectual capital help countries achieve robust growth. They found that because of the high spill-overs of intellectual capital, there are interactions among sub-categories of intellectual capital or between intellectual capital and other macro factors (e.g. exports). The direct and indirect (via interactions) effects of intellectual capital are mutually enhancing factors and possess multi-dimensional outcomes. Shadab (2021) estimated the short-run and long-run relationships between export diversification, intellectual capital (denoted by physical and human capital), imports and economic growth in the United Arab Emirates (UAE) between 1975 and 2017. The study's findings confirm the existence of a significant long-run relationship between the variables, confirming the export-led growth hypothesis for the UAE. However, intellectual capital had a negative and insignificant impact on economic growth in this country.

With a panel sample at the firm level in an emerging economy, Sharma and Dharni (2017) analysed the status and trend of intellectual capital disclosures by selected companies in India. Their results indicate that intellectual capital disclosures tend to increase with the size of the organisation. In addition, intellectual capital and export intensity had positive effects on firm growth over the study period. In the case of the Brazil, Russia, India, China and South Africa (BRICS) countries, Nadeem et al. (2017) evaluated the dynamic relationship between intellectual capital and firm performance. Their findings confirm that intellectual capital is significantly associated with firm growth. Overall, considering recent empirical results, the export-led growth hypothesis in emerging economies has not received enough academic attention. Evidence from a full sample of emerging economies worldwide is lacking. Moreover, intellectual capital has not been added to the export-led growth model to test its impact on economic growth. As a result, an empirical study focusing on emerging economies is needed. The present study attempts to fill this empirical research gap in the current literature.

Methodology

We test the export-led growth hypothesis, assuming that intellectual capital can have a positive effect on economic growth both directly as an independent variable and indirectly as an interaction variable (with exports) in the econometric equations. The most important variable in the hypothesis is the export variable, and a number of key aspects of economic growth are added to the functions, including education, intellectual capital, pollution and poverty in the countries in the research sample. Aside from the examination of the export-led growth hypothesis and unlike other works, this study considers intellectual capital as a driver of economic development in emerging economies. Excluding the poverty rate, all values of the variables are converted to the natural logarithm formats. A log-linear model is employed because it can easily take the elasticities between variables and does not depend on the units of the variables. The research models are presented below.

$$\begin{aligned} LogY_{i,t} = \varphi_0 + \varphi_1 LogEX_{i,t} + \varphi_2 LogEducation_{i,t} + \\ \varphi_3 LogIntellect_{i,t} + \\ + \varphi_4 LogPollution_{i,t} + \varphi_5 Poverty_{i,t} + u_{i,t} \end{aligned} \quad (1)$$

To check the interactional impact of export and intellectual capital on economic growth, a second equation is formulated as follows.

$$\begin{aligned} LogY_{i,t} = \lambda_0 + \lambda_1 LogEX_{i,t} + \lambda_2 LogEducation_{i,t} + \\ \lambda_3 LogIntellect_{i,t} * LogEX_{i,t} + \\ + \lambda_4 LogPollution_{i,t} + \lambda_5 Poverty_{i,t} + v_{i,t} \end{aligned} \quad (2)$$

In the two equations, the export-led growth hypothesis is examined based on the sign and significance of the coefficients (including φ_1 and λ_1) of logEX, which is the natural logarithmic of the real export value. If these coefficients are positive and significant, the export-led growth hypothesis is confirmed in these emerging economies. The impact of intellectual capital is explored using the sign and significance of the coefficients (including φ_3 and λ_3) of LogIntellect and LogIntellect *LogEX. Notably, u and v are the error terms, i is the cross-sectional units with $i \in [1, n]$, and t denotes time periods.

Because many time series are non-stationary, however, the application of ordinary least squares (or other similar methods) for non-stationary time series may produce spurious results. Specifically, the estimated results may show that there is a significant relationship between two given variables, which are in fact uncorrelated (Gonzalo, 1994). To deal with this potential problem, panel unit root tests can be employed to check the stationarity of the variables. The testing methods include the Levin-Lin-Chu (LLC; Levin et al., 2002), Breitung (2000) and Im-Pesaran-Shin (IPS; Im *et al.*, 2003) tests. When panel data variables are stationary at the level (denoted as I(0)) or the first differences (denoted as I(1)), the Kao cointegration test is applied to determine the existence of a long-term relationship between variables (Kao, 1999). If a long-term cointegration relationship is confirmed, the long-term coefficients can be estimated by the panel ordinary least squares method. The panel estimated process is performed with both the fixed-effects model and the random-effects model. In the next step, the Hausman test (Hausman, 1978) is applied to identify the best model between the fixed-effects and the random-effects model. The Hausman method checks the null hypothesis (H_0) that the unobservable individual-specific random errors are uncorrelated. If the p-value is lower than 5 %, the null hypothesis is rejected, the result of the random effect is biased, and the result of the fixed-effects model is the better one.

This study employs a dataset including 31 emerging countries worldwide. Emerging economies are a very interesting group for examining the export-led growth hypothesis because their experiences can be useful to other countries for their long-run development strategy. Emerging

economies have been recognised as a major engine of global prosperity in recent decades, and their contributions have been calculated as amounting to between one-quarter and one-half of the growth rate of the world economy (Johnson, 2008). A panel of secondary-data was assembled covering 28 years from 1992 to 2019 and the variables under study, including the real GDP (Y, in USD), the real export value (EX, in USD), real government expenditure on education (Education, in USD), the real intellectual capital usage (Intellectual property payments, in USD), CO_2 emissions (Pollution, in kt), the poverty rate (Poverty, in percentage). All these macroeconomic variables were converted in real terms using the GDP deflator taken from the World Development Indicators; in the econometric functions, the variables are expressed in the natural logarithmic form.

The data was directly downloaded and calculated from the World Development Indicators database of the World Bank (2021a). The list of emerging countries used in the study sample includes Argentina, Brazil, Bulgaria, Chile, China, Colombia, the Dominican Republic, Ecuador, Egypt, Hungary, India, Indonesia, Kenya, Lebanon, Malaysia, Mexico, Morocco, Nigeria, Pakistan, Peru, the Philippines, Poland, Romania, the Russian Federation, Senegal, South Africa, Thailand, Tunisia, Turkey, Ukraine and Uruguay. The group of emerging economies is defined by the International Monetary Fund (IMF) (2021) and Morgan Stanley Capital International (2023). Our sample includes countries that have passed the income threshold and joined the high-income group (e.g. Poland and Hungary); however, they were classified as emerging economies in the early 2000s and were thus kept in the study sample. Conversely, because of the unavailability of statistics, some emerging economies (e.g. Vietnam and Venezuela) were not included in the sample.

Further, because intellectual-capital payments significantly increased after 2003, in addition to the full sample, the database was divided into two periods, 1992–2002 and 2003–2019, to compare the impact of intellectual-capital usage on economic growth in these economies. The full panel database was also split into two sub-groups of countries, the lower-middle-income group (10 countries) and the upper-middle-income group (20 countries) (see World Bank, 2021b). The estimated results for sub-groups helped us to compare the export-led growth hypothesis in each income group as well as the differences in the impacts of intellectual-capital usage on economic growth between these groups. We chose to use the database of the World Development Indicators because it is reliable and offers a variety of statistical indicators for countries worldwide; in particular, it contains the largest time series for countries or regions, going back more than 50 years. Brief descriptive statistics of the variables are presented in Table 1.

Table 1

A Statistical Summary of the Variables

Sample	Variable	Max	Min	Mean	Std. Dev.	Obs
Full panel (31 economies)	LogY	34.647	2.0553	28.261	2.0553	867
	LogEX	33.107	2.1027	26.860	2.1027	803
	LogEducation	31.300	1.9414	25.062	1.9414	528
	LogIntellect	28.880	2.8528	21.748	2.8528	784
	LogPollution	16.147	1.6028	11.522	1.6028	713
	Poverty	52.276	9.0390	22.559	9.0390	788
Lower-middle income group (11 countries)	LogY	32.155	21.401	27.967	1.8837	308
	LogEX	30.537	20.049	26.522	1.7918	286
	LogEducation	28.830	19.310	24.524	1.5614	163
	LogIntellect	26.123	12.956	21.210	2.3016	272
	LogPollution	14.621	8.0910	11.239	1.5842	253
	Poverty	50.650	0.5302	24.162	9.7591	284
Upper-middle income group (20 countries)	LogY	34.647	20.926	28.422	2.1284	559
	LogEX	33.107	20.235	27.047	2.2361	517
	LogEducation	31.300	19.240	25.303	2.0454	365
	LogIntellect	31.300	4.6060	22.035	3.0700	512
	LogPollution	28.880	8.3110	11.680	1.5924	460
	Poverty	16.147	0.1635	21.656	8.4843	504

Source: *Calculated from the study data.*

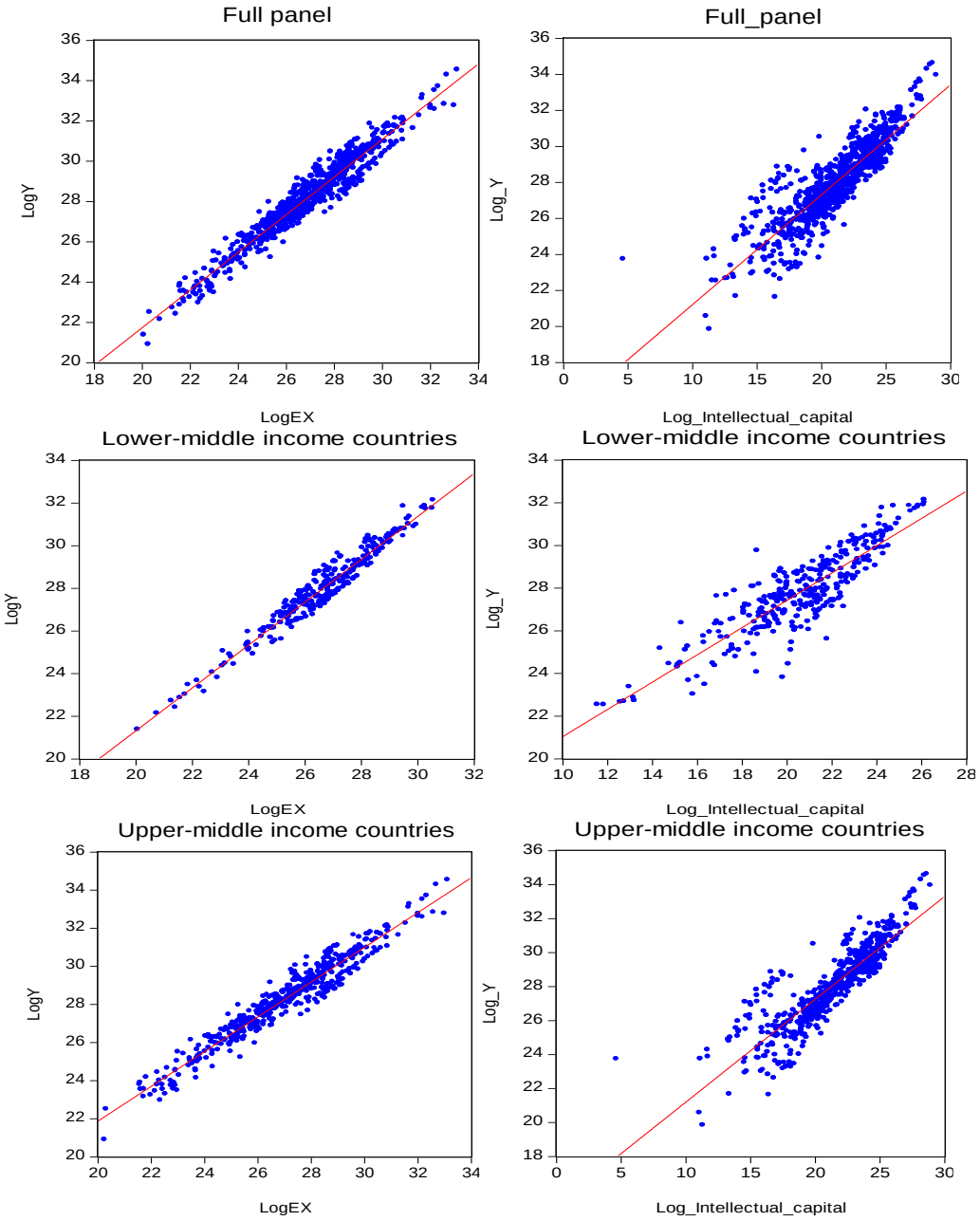

Figure 1. Economic Growth–Exports and Economic Growth–Intellectual Capital

Figure 1 shows some initial graphs of the potential relationships between the natural logarithm values of economic growth, export and intellectual-capital usage in the three study samples. To combine with the descriptive statistical analysis, graphing techniques were applied to present the potential impact of export and intellectual-capital usage on economic growth in the sample countries. Six scatter plots were drawn based on the full panel sample and two sub-groups. Based on the potential trends, these graphs can help to predict quantitative results in the next section. The vertical axis presents the natural logarithm value of the real GDP (LogY), and the horizontal axis denotes the natural logarithm value of real exports (LogEX) and the natural logarithm value of real intellectual-capital payments (LogIntellectual capital usage) in the same period, respectively. Six linear regression lines illustrate the expected relationship between these variables. Based on these graphs, six scatter plots imply positive relationships between the LogY and LogEX and positive relationships between the LogY and the LogIntellectual capital usage as well. Therefore, the export-led growth hypothesis is expected to be confirmed in these emerging economies over the study period. The role of intellectual-capital usage in supporting economic growth can also be predicted in the next section.

Results and Discussion

Panel unit Root test and Panel Cointegration Test

Before estimating the export-led growth equations, we tested all variables for the unit root phenomenon to identify potential long-run cointegration at levels (denoted by I(0)) or at the first difference (denoted by I(1)). We checked the null hypothesis (H_0) of the existence of a unit

root against the alternative hypothesis of no unit roots (H_1). As mentioned in the estimation strategy, we used three testing methods: LLC, Breitung and IPS. Table 2 presents the results of the panel unit root tests for the level and first difference of the variables of the full panel of countries and two sub-groups. Except for poverty, all variables are stationary at the 1 % level of significance. However, when using the first difference data, the testing methods confirmed that all variables are stationary at the 1% level of significance. Hence, the testing indicates that the variables are integrated of order one, denoted by I(1). This evidence confirms the suitability of the cointegration test for checking the potential cointegrated relationship amongst variables in the long run (Gonzalo, 1994).

Table 2

The Panel unit Root Test for the Variables

The full panel sample: 31 countries						
Method	LogY	LogEX	LogEducation	LogIntellect	LogPollution	Poverty
In level data						
LLC	-6.820***	-7.779***	-5.094***	-4.330***	-2.342***	-0.356
Breitung	-4.709***	-5.845***	-3.258***	-4.836***	-0.278	-1.031
IPS	-9.134***	-7.753***	-1.899*	-7.357***	-2.221**	-2.878***
In first diffirence data						
LLC	-13.41***	-14.17***	-17.40***	-14.76***	-13.54***	-14.83***
Breitung	-7.027***	-7.851***	-9.126***	-8.430***	-8.890***	-9.406***
IPS	-19.17***	-20.26***	-7.859***	-17.04***	-12.70***	-16.71***
The lower-middle income sample: 11 countries						
In level data						
LLC	-5.623***	-5.697***	-5.082***	-3.842***	-0.548	-0.474
Breitung	-2.432***	-1.815*	-2.229**	-3.665***	-0.468	0.625
IPS	-6.191***	-5.321***	-2.781***	-5.615***	-0.006	0.850
In first diffirence data						
LLC	-9.249***	-9.003***	-11.23***	-9.915***	-9.146***	-9.454***
Breitung	-2.871***	-6.461***	-1.339*	-4.418***	-4.944***	-4.637***
IPS	-13.25***	-12.64***	-4.301***	-11.71***	-7.727***	-12.29***
The upper-middle income sample: 20 countries						
In level data						
LLC	-4.357***	-5.539***	-3.169***	-2.767***	-2.385***	-1.408*
Breitung	-4.052***	-5.580***	-2.713***	-3.765***	-0.110	-2.748***
IPS	-6.781***	-5.709***	-0.728	-4.988***	-2.738***	-2.954***
In first diffirence data						
LLC	-9.597***	-10.97***	-14.16***	-11.00***	-10.14***	-11.06***
Breitung	-6.793***	-5.396***	-7.850***	-7.230***	-7.439***	-8.619***
IPS	-14.05***	-15.86***	-6.578***	-12.70***	-10.08***	-11.69***

Notes: ***,**,* denotes rejection of the null hypothesis at the 1%, 5%, 10% level, respectively.
Source: *Calculated from the research data*

The analysis of long-run cointegrating relationships among a group of variables has received much attention in modern quantitative analysis. This study employed the Johansen testing method (Johansen, 1988) merged with the technique of Kao (1999) for the panel data format. This method considers various forms of the residual-based panel Fully Modified OLS (FMOLS) estimator that can produce asymptotically unbiased, normally distributed coefficient estimates. The full panel and two sub-groups were included in the test. The null hypothesis (H_0) of no long-run cointegration is rejected when these statistics are statistically significant at the 1 % level. Based on the cointegration test's results, there are long-term relationships between the variables, including economic growth, exports, education, intellectual-capital usage, pollution and poverty in the case of the 31 emerging economies over the study period. The results of the panel cointegration test are presented in Table 3.

Table 3

The Kao Panel Cointegration test Results

The null hypothesis (H_0): There is no cointegration equation	**Kao statistic test**	**P-value**	**Conclusion**
The cointegration test for the variables in Equation (1)			
Full panel sample: 31 countries	-7.9328	0.000	Reject H_0
Lower – middle income sample: 11 countries	-2.8476	0.002	Reject H_0
Upper – middle income sample: 20 countries	-8.4735	0.000	Reject H_0
The cointegration test for the variables in Equation (2)			
Full panel sample: 31 countries	-8.0595	0.000	Reject H_0
Lower – middle income sample: 11 countries	-2.8056	0.002	Reject H_0
Upper – middle income sample: 20 countries	-8.7338	0.000	Reject H_0

Source: *Calculated from the study data*

Panel Regression Results

Full-Panel Sample

The panel cointegration test reveals long-run relationships between the independent variables and economic growth in all countries. Following the current research targets, first, the most important coefficients in the estimated results are the sign and significance level of export variables because this evidence helps to confirm the export-led growth model in these emerging economies (see Reza *et al.*, 2018; Adedoyin *et al.*, 2022). Second, the sign and significance level of intellectual capital–usage variables and the interactional variables (between intellectual-capital usage and export) help to identify the real impact of intellectual-capital usage on economic growth in the study sample. Table 4 presents the effects of the independent variables on economic growth for the full panel sample of 31 emerging countries. The fixed effects and random effects are quite similar in the estimated results. As presented in the methodology section, the Hausman test helps to choose which is the better model between the fixed-effects and the random-effects models.

The full-panel sample yielded some interesting findings. First, the estimated results showed that exports significantly increase economic growth across the different estimated equations. The Hausman test confirmed that the fixed effects are better than the random effects in all estimated results (Hausman, 1978). Because the sign of export variables was positive and significant at the 1 % level, the export-led growth hypothesis was confirmed in the case of the 31 emerging economies. Second, the values of export coefficients in 2003–2019 were significantly higher than those in 1992–2003, which highlights the expansion of the export-led growth model in practical policy in these countries. Our empirical results make a distinct contribution compared to previous evidence such as that presented by Rani and Kumar (2018). A high export value can lead to a higher economic growth rate. Furthermore, the results show that the export-led growth model plays an important role in improving growth and is a good development strategy for these countries in the near future.

Table 4

Impact of Export on Economic Growth with the Full Panel Sample

Dependent variable is economic growth (LogY)						
Variable	1992 – 2002 period		2003-2019 period		1992-2019 period	
	Fixed effects	*Random effects*	*Fixed effects*	*Random effects*	*Fixed effects*	*Random effects*
LogEX	0.355***	0.342***	0.472***	0.467***	0.349***	0.347***
LogEducation	0.655***	0.660***	0.513***	0.516***	0.594***	0.590***
LogIntellect	-0.013	-0.014	0.012*	0.012*	0.025***	0.026***
LogPollution	-0.183**	-0.001***	-0.057*	-0.029	-0.133***	-0.052**
Poverty	-0.002	-0.003**	-0.004**	-0.004**	-0.003**	-0.004**
Constant	4.726***	2.915***	3.078***	2.845***	4.985***	4.241***
R_square	0.9966	0.9599	0.9980	0.9607	0.9960	0.9645
Observation	134	134	280	280	414	414
No of countries	31	31	31	31	31	31
Hausman test	12.61 (0.013)		11.93 (0.017)		23.52 (0.000)	
Dependent variable is economic growth (LogY)						
Variable	1992 – 2002		2003-2019		1992-2019	
	Fixed effects	*Random effects*	*Fixed effects*	*Random effects*	*Fixed effects*	*Random effects*
LogEX	0.375***	0.356***	0.459***	0.455***	0.327***	0.323***
LogEducation	0.675***	0.661***	0.512***	0.515***	0.595***	0.591***
LogIntellect*LogEX	-0.001	-0.001	0.001*	0.001*	0.001***	0.001***
LogPollution	-0.184**	-0.002***	-0.056	-0.029	-0.132***	-0.051***
Poverty	-0.003	-0.003**	-0.004	-0.004**	-0.003**	-0.004***
Constant	4.267***	2.573***	3.379***	3.148***	5.522***	4.816***
R_square	0.9966	0.9596	0.9980	0.9606	0.9959	0.9645
Observation	134	134	280	280	414	414
No of countries	31	31	31	31	31	31
Hausman test	12.90 (0.011)		11.97 (0.017)		23.14 (0.000)	

Notes: ***, **, * display significant at 1 %, 5 %, 10 %, respectively. P-value is in the parentheses.
Source: *Calculated from the study data*

The results of the estimation of the impact of intellectual-capital usage on economic growth are also presented in Table 4. Overall, intellectual-capital usage had a positive and significant impact on economic growth in the study period, where a 1 % increase in intellectual-capital usage led to a 0.025 % increase in economic growth for the period 1992–2019. In addition, the interactive variable between intellectual-capital usage and export had positive and significant effects on economic growth, which indicates the important role of intellectual-capital usage in supporting economic growth in these countries. This finding also expands the discussion in previous studies, such as those of Kozak (2013) and Nadeem et al. (2017). Intellectual-capital usage in the sample countries robustly increased by 52 times from 1992 to 2019, from $1.56 billion in 1992 to $82.3 billion in 2019 (World Bank, 2021a). The growth rate of intellectual-

capital usage reached 16.5 % per year over the study period. Based on the average growth rate of intellectual-capital usage (16.5 % per year), it can help to rise to around a 0.41 % in economic growth rate per year in these countries over the study period. The full-panel estimation yielded another finding. The coefficient of LogIntellectual capital was only positive and significant in the 2003–2019 period (negative and insignificant in the 1992–2002 period). This means that intellectual capital increased significantly in these countries in 2003–2019 and that consequently, this variable only had a positive effect on economic growth in this period. The estimated results suggest that governments should consider using more intellectual capital resources to serve sustainable economic growth in the future (see Kozak, 2013; Nadeem *et al.*, 2017; Alvino *et al.*, 2021). Regarding other independent variables, the coefficient of education was positive and significant, suggesting that education played an important role in increasing economic growth in the full period and two sub-periods. This finding is in line with previous suggestions regarding the education-growth nexus (e.g. Permani, 2009; Tvaronaviciene *et al.*, 2017). The coefficients of the pollution variables were found to be negative and significant, indicating that an increase in the pollution level led to a reduction in economic growth (for example, see Zheng *et al.*, 2015 for evidence in the Chinese case). Poverty is considered a harmful variable of economic growth in these countries, as Nakabash (2018) found in Brazil. The estimated results demonstrated that poverty had negative and significant effects on economic growth in both kinds of econometric equations. Although the countries in our sample have achieved great progress in reducing their poverty rates, the empirical evidence implies that their leaders must try to lower the poverty rate as much as possible.

Lower-Middle-Income Group

As discussed in the methodology, to identify differences in the effects of independent variables on economic growth in a variety of study samples, the full-panel sample was divided into two sub-samples. This section presents the results in the case of the 11 countries in the lower-middle-income group. The group classification criteria were based on the indicators from the World Bank (2021b). The estimation process for the sub-samples was the same as for the full-panel sample. Six estimation results were selected for the discussions (fixed effects or random effects). Based on the suggestions of the Hausman test, the random-effects model was deemed the better model. All estimation results are presented in Table 5.

Table 5

Impact of Export on Economic Growth: Lower Middle Income Countries

Dependent variable is economic growth (LogY)						
Variable	1992–2002 period		2003–2019 period		1992–2019 period	
	Fixed effects	*Random effects*	*Fixed effects*	*Random effects*	*Fixed effects*	*Random effects*
LogEX	0.626***	0.530***	0.493***	0.489***	0.456***	0.455***
LogEducation	0.377**	0.461***	0.521***	0.515***	0.529***	0.527***
LogIntellect	-0.013	0.001	-0.016	-0.001	0.019	0.024
LogPollution	0.284**	0.139*	-0.036	0.004	-0.058	-0.037
Poverty	-0.006	-0.006*	-0.001	-0.001	-0.002	-0.002
Constant	-0.717	0.984	2.666***	2.309***	2.943***	2.763***
R_square	0.9976	0.9549	0.9982	0.9549	0.9960	0.9498
Observation	50	50	85	85	135	135
No of countries	11	11	11	11	11	11
Hausman test	4.402 (0.493)		4.724 (0.450)		2.873 (0.719)	
Dependent variable is economic growth (LogY)						
Variable	1992–2002 period		2003–2019 period		1992–2019 period	
	Fixed effects	*Random effects*	*Fixed effects*	*Random effects*	*Fixed effects*	*Random effects*
LogEX	0.643***	0.535***	0.491***	0.484***	0.445***	0.444***
LogEducation	0.375**	0.458***	0.517***	0.513***	0.530***	0.528***
LogIntellect*LogEX	-0.001	-0.001	-0.001	-0.001	0.001	0.001
LogPollution	0.283**	0.140*	-0.028	0.006	-0.061	-0.039
Poverty	-0.006**	-0.006**	-0.001	-0.001	-0.002	-0.002
Constant	-1.048	0.947	2.524***	2.291***	3.289***	3.128***
R_square	0.9976	0.9477	0.9982	0.9557	0.9966	0.9494
Observation	50	50	85	85	135	135
No of countries	11	11	11	11	11	11
Hausman test	4.478 (0.428)		4.447 (0.487)		2.824 (0.7270)	

Notes: ***, **, * display significant at 1 %, 5 %, 10 %, respectively. P-value is in the parentheses.
Source: *Calculated from the study data*

First, the export-led growth model was confirmed in the case of the 11 lower-middle-income countries, where the coefficients of the export variable were positive and significant at the 1% level. The values of the coefficients of the export variable in the 1992–2002 period were significantly higher than in the 2003–2003 period, which implies that these emerging economies had other sources of economic growth in the near period. This finding expands previous results in this group, such as those of Ziramba (2011) in South Africa or Agrawal (2015) in India. The dependence of economic growth on the export sector in the early period can be explained by the fact that some countries had only begun the economic innovation process at the beginning of the 1990s. Conversely, in the 2003–2019

period, many countries had successfully transitioned their economies and had other sources of economic growth, such as tourism development.

We report an important finding related to intellectual capital. Despite its positive sign, the impact of this variable on economic growth was not significant over the full period. This may be because of missing financial resources in these countries, making the application of intellectual capital in economic activities quite low for the study period. This finding is supported by the discussion of Jednak et al. (2017), which implies that while intellectual capital is a driver of economic development in advanced economies, it is less dominant in developing countries. Our finding also highlights the biggest challenge faced by lower-middle-income countries, namely, their insufficient potential for escaping the middle-income trap, as previously discussed by Lentjushenkova and Titko (2017) and Otsuka et al. (2017). The results also suggest that the policymakers in these countries need to consider and employ intellectual capital as a new engine for enhancing economic growth in the next period. This technical-knowledge resource is very useful in increasing national competitiveness, which can help countries to join the upper-middle-income group in recent years. In addition, because of the positive sign and statistical significance of the coefficient values, the education variable is highlighted as a key factor in improving economic growth in the lower middle income countries. An increase in government expenditure on education created an increase in economic growth in all estimation results. This suggests that leaders in these countries must place education at the centre of any development strategies in the future.

The pollution variable was found to have a positive and significant effect on economic growth in the early period (1992–2002). The estimations indicated that many lower-middle-income countries had industry sectors producing high levels of pollution for the domestic environment. However, in the early stages of development, industries that harm the environment expanded in these countries. The negative and insignificant coefficients of the pollution variable in the next period (2003–2019) suggest that these countries did not accept industries that are harmful to the environment. Finally, the poverty variable had a negative and significant effect on economic growth in the first period (1992–2002).

Upper-Middle-Income Group

Many upper-middle-income countries have some of the characteristics of a developed country but do not fully meet these standards. Our study sample included some emerging economies that have successfully joined the group of developed countries in previous years. As discussed previously, the upper-middle-income group comprised 20 emerging economies. Similar to the full-panel estimation results, we chose six estimation outputs for the investigation of this group. The results of the Hausman test confirmed that the fixed-effects model was better than the random-effects model; therefore, we selected the fixed-effects model for the discussion. The estimation results for the upper-middle-income group are presented in Table 6.

Table 6

Impact of Export on Economic Growth: Upper-middle Income Countries

Dependent variable is economic growth (LogY)						
Variable	1992–2002 period		2003–2019 period		1992–2019 period	
	Fixed effects	*Random effects*	*Fixed effects*	*Random effects*	*Fixed effects*	*Random effects*
LogEX	0.283***	0.268***	0.507***	0.487***	0.328***	0.316***
LogEducation	0.762***	0.748***	0.482***	0.500***	0.610***	0.609***
LogIntellect	-0.045*	-0.028	0.012**	0.011*	0.026***	0.028***
LogPollution	-0.416***	-0.069*	-0.114***	-0.058**	-0.240***	-0.067***
Poverty	0.006	0.007	-0.010***	-0.010***	-0.008***	-0.007***
Constant	7.260***	3.644***	3.655***	3.134***	6.504***	4.812***
R_square	0.9970	0.9651	0.9982	0.9549	0.9961	0.9738
Observation	84	84	195	195	279	279
No of countries	20	20	20	20	20	20
Hausman test	30.13 (0.000)		34.02 (0.000)		46.98 (0.000)	
Dependent variable is economic growth (LogY)						
Variable	1992–2002 period		2003–2019 period		1992–2019 period	
	Fixed effects	*Random effects*	*Fixed effects*	*Random effects*	*Fixed effects*	*Random effects*
LogEX	0.315***	0.280***	0.495***	0.478***	0.292***	0.227***
LogEducation	0.766***	0.750***	0.480***	0.499***	0.613***	0.612***
LogIntellect*LogEX	-0.001*	-0.001	0.001*	0.001	0.001***	0.001***
LogPollution	-0.426***	-0.073*	-0.112**	-0.057**	-0.235***	-0.069***
Poverty	0.007	0.007	-0.010***	-0.010***	-0.008***	-0.006**
Constant	6.393***	3.202***	3.963***	3.395***	7.204***	5.647***
R_square	0.9970	0.9649	0.9982	0.9631	0.9961	0.9735
Observation	84	84	195	195	279	279
No of countries	20	20	20	20	20	20
Hausman test	30.45 (0.000)		33.69 (0.000)		45.89 (0.000)	

Notes: ***, **, * display significant at 1 %, 5 %, 10 %, respectively. P-value is in the parentheses.
Source: *Calculated from the study data*

Following the relevant literature, after testing for cointegration, we sought to determine through quantitative methods whether the export-led growth hypothesis is valid for the countries in the study sample. In Table 6, the estimation results show that the export variables had positive and significant effects on economic growth at the 1% level of significance. This empirical evidence helps to confirm the export-led growth model's validity in the case of the upper-middle-income group for the study period. This result consolidates and expands previous findings that only focused on specific economies, for example, Turkey for Ozturk and Acaravci (2010) and China for Liu et al. (2019).

The findings reported in Table 6 indicate that over the full period (1992–2019), intellectual capital had a positive and significant effect on economic growth in this group of countries. In addition, intellectual capital can help to expand the positive effect of exports through an interactive effect. The important role of intellectual-capital usage in supporting economic growth in the upper-middle-income group was reflected in the high value of its coefficient compared to previous results. Based on the estimation results, intellectual capital is a robust and efficient resource for countries that successfully avoid the middle-income trap, a popular problem for this group of countries (see Otsuka et al., 2017; Radosevic & Yoruk, 2017). This finding implies that these emerging economies may have some characteristics of developed economies, and intellectual capital can thus be considered a catalyst to expand the positive effect of other resources in the economic system and improve economic growth. The empirical evidence suggests that the governments of these countries need to increase the use of intellectual capital to maintain the momentum of growth in the next years. Intellectual capital can be regarded as a key resource for these countries to join the list of developed countries within the decade.

The coefficients of the education variable in the upper-middle-income group were significantly higher than for the lower-middle-income group in all estimated results. This implies that education is an important resource that helps to maintain economic growth in the upper-middle-income group. Many countries in this group have a high position in worldwide education rankings, and education may be a strength of these economies in increasing their level of competitiveness. Conversely, pollution is a very harmful variable for economic growth in these countries. The coefficients of the pollution variable had a negative and significant impact on economic growth in all estimated results. The values of the pollution variable indicated that upper-middle-income countries had a high sensitivity to increases in pollution levels. Because some key economic sectors (e.g. tourism) require healthy natural environmental conditions, policymakers in these countries must carefully check the pollution phenomenon and contain the development of some industries that pollute the environment. Finally, although the estimation results confirmed poverty's negative effect on economic growth, the values of the coefficients are low. This coincides with the current perspective on poverty in these countries, where the poverty rates are significantly lower than in other developing countries. Therefore, these findings imply that policymakers in these countries should further reduce the poverty rate and put an end to poverty.

Conclusion

The paper examined the export-led growth hypothesis with a panel sample including 31 emerging economies worldwide. These countries have been ranked at the top of economic growth in recent decades. The panel database covers the period 1992–2019 and was divided into two sub-periods (1992–2002 and 2003–2019) and two sub-samples (lower-middle-income and upper-middle-income countries). A panel cointegration test and panel estimation were applied to investigate the potential effects of exports on economic growth in this group of countries in addition to exploring the role of intellectual-capital usage. The study's findings make a number of contributions. First, these empirical results are the first evidence focusing on the export-growth nexus topic with a large sample of emerging economies; hence, the study helps to fill the empirical research gap in the contemporary literature. Second, the estimation results confirmed the existence of long-term cointegration relationships between economic growth and independent variables in this group of economies. The positive signs and statistical significance of the coefficients of the export variables indicate the validity of the export-led growth hypothesis in these economies. This empirical result also highlights that policymakers should persist in pursuing an export-led growth model in the future. Third, intellectual-capital usage had positive and significant effects on economic growth in upper-middle-income countries both directly and indirectly. However, the positive effect of this variable was not found when focusing on the lower-middle-income group. Fourth, our findings showed that education is a key variable for supporting economic growth in both the full sample and the two sub-samples. In addition, pollution and poverty were found to have negative effects on economic growth in most countries in the study sample.

The study's findings have several policy implications for the leaders in the countries in the sample. The empirical evidence suggests that the export-led growth model is still valid and a valuable development strategy for improving economic growth in these countries. A large number of emerging economies are in the middle-income group, and the empirical results emphasise that the expansion of the export sector is an important and integral component of an economic development strategy. Additionally, the evidence also suggests that emerging economies (and other countries) should employ more and more intellectual capital to increase their competitiveness and support economic growth. Moreover, although public expenditure always increases robustly in response to a variety of public demands during booming development periods, governments should maintain spending on education as a priority. Meanwhile, policymakers should also carefully monitor the harmful factors (pollution and poverty) for growth and put suitable solutions in place to control them. Finally, emerging economies should improve their domestic competitiveness and further join international value chains, which can help them join the group of developed countries in the future.

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