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2022

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Abstract

The aim of this investigation is to check the impact of digitalization and trade openness on economic growth for top ten richest Asian countries. Static Gravity Model and Generalized Method of Moments Model were estimated. We found that digitalization and trade openness have a significant positive effect on economic growth. These results prove that trade openness and digitalization is a source of economic growth for richest Asian countries. Due to the magnitude of the positive externalities attached to the trade openness and digitalization, in terms of technology transfer bias, financial capacities, economic policies, human expertise, plenty of natural resources, large markets size, and spillover effect added to the domestic capacities and the national investment, the pace of the phenomenal economic performance of the Asian economies is very well marked.

Keywords: Digitalization, Trade Openness, Economic Growth, Richest Asian Countries.

JEL Codes : E22, F14, O16, O30, O47, O53

1. Introduction

Economic growth is an important part of the main national social and economic development goals. Much political and scientific research has sought to figure out how to maximize welfare and improve competitiveness and economic growth. Therefore, the analysis of economic growth and its determinants is important for all developed and developing economies. Why is economic growth increasing faster in some countries, for example Asian countries, than others? Most empirical research addressing this question focuses on a few explanatory variables to respond to the statistical challenges posed by a limited number of countries. Where selected variables are driven by policy or theory values. However, because researchers disagree about which explanatory variables are the most important a priori, there is often only partial overlap between the variables considered in the various empirical studies.

Discussions about digital transformation have been circulating for years, but they are poorly explained. Indeed, the digital transformation of business models, how business models can be digitally transformed, steps and tools to consider and examples of available catalysts. Similarly, digitization is due to a fundamental shift in corporate thinking, systems, and the fundamental tools needed to realign part of the economy or the entire country. Digital transformation is about using the digital fabric to change the technological fabric of society. With structure, products, services, user experience, processes, etc. We mean anything that consists of parts organized together, such because of digitization, the physical and social aspects of buildings have changed.

Digitization reduces the costs of the marketing strategy. This strategy often spans a long period of time and reaches the enthusiasm of thousands of cyber and e-shoppers. Here the consumer is no longer passive but hedonistic because he becomes an actor in his consumption and values participation. In fact, the internet has become a tool for the surfer to see, evaluate and buy a product. Amazon, for example, pioneered collaborative marketing techniques by asking readers to write book reviews and organizing such follow-ups. For this reason, most websites offer banner ads on their homepage. It's about promoting their products and making their brand interactive. The web is "a showcase for a company" and enables the advertiser to achieve various goals.

In addition, the internet provides permanent and unlimited access to the product due to its endless nature. A company or product found on the Internet has the chance to be seen thousands

of times by Internet users 24 hours a day. With this advantage, many companies no longer hesitate to get closer to the network. Because this tool gives great visibility to products or companies and thus creates a relationship of trust among Internet users. In addition, digitalization has enabled advertisers to create groundbreaking strategies that allow them to be close to their customers. This is the case with online advertising aimed at traffic, sales, exposure to a new audience target or loyalty; Email and newsletters aimed at achieving and maintaining a nearly one-on-one goal, viral marketing aimed at gaining awareness and sales; Online guerrilla warfare with a specific target of visibility, influence, and sales.

Digitization brings significant efficiency gains for industry and services. In this context, some economists argue that knowledge sharing, capitalization in the company through the development of networks, identification, collection, processing of customer and customer information is now at the center of the wealth creation process. Another benefit of digitization is that we can objectively evaluate the impact of a product (cybermarket) launched; unlike a traditional campaign whose impact is often measured by sales. For this purpose, marketers use tools that allow them to generate statistics such as one-time visits, repeat visits, click-through rates on ads. The idea that trade openness is one of the most important determinants of economic growth has spread among governments in countries around the world. The evidence seemed to suggest that countries with trade openness outperformed countries with high barriers to entry and high capital. Indeed, the macroeconomic consequences of opening trade in Asian countries have been the subject of much debate for decades, in the context of the increasing internationalization of trade in goods and services.

The economics literature continues to grow and diversify with the experiences of different countries, depending on whether they are developed, or developing countries. Among the beneficial effects on economic growth, many argue that the trade opening process plays an important role in improving the commodity by increasing productivity. The development of economic growth theories has highlighted the important role of trade openness as a factor that can promote long-term growth and productivity. In fact, almost all empirical studies conclude that there is a causal relationship between trade openness and economic growth (Michaely, 1977; Frankel and Romer, 1999).

However, few studies have examined together the links between digitization, trade openness and economic growth. Moreover, such empirical exercise has never been done in the context of wealthier Asian countries. In this article, we try to fill these gaps by examining the relationship

between digitalization, trade opening and economic growth in the ten richest Asian countries. The remainder of the article is structured as follows: Section 2 examines the theoretical and empirical impact of digitization and trade opening on economic growth. Section 3 gives a first overview of the data and empirical methodology. Section 4 considers the incidence results for each. Section 5 concludes the document with some policy implications.

2. Literature Survey

Digitalization and commercial openness are very important and topical issues in terms of the change that affects the world economy, which is becoming based on the development of technology and the expansion of communication, the aim of which is to improve economic growth and to stimulate sustainable development. In this section, we will present the works that focus on the link between digitalization and economic growth and on the link between trade openness and economic growth.

2.1.Trade openness and economic growth

In general, the theoretical literature on economic growth and trade openness shows that trade openness is a very important factor for improving economic growth. In fact, trade openness is seen as one of the fundamental determinants for refining domestic investment and for boosting productivity and growth. Studies that have shown that trade openness has a significant positive impact on economic growth include Michaely, (1977); Balassa, (1995); Tyler, (1981); (1989); Fosu, (1990); Ram, (1987), Bakari (2017c), Bakari and Mabrouki (2018), Bakari (2020); Bouchoucha and Bakari (2019). In contrast, others have concluded that the positive relationship between trade openness and economic growth does not exist during certain periods for certain countries {Helleiner (1986), Ahmad and Kwan (1991), Bakari et al (2018), Bakari (2018a; 2018b)}. For example, Olubiyi (2014) studied the impact of exports and imports on economic growth in Nigeria for the period from 1980 to 2012. The empirical results indicate that only exports generate economic growth. Wang et al (2019) claimed that trade openness significantly improves economic growth. According to Zhang et al (2019), openness to the outside world has a significant positive impact on China's economic growth. Zhang and Guo (2019) reported that the degree of trade openness has an asymmetric effect on economic growth in China. Bakari and Mabrouki (2017) investigated the impact of exports and imports on economic growth in Panama for the period 1980 – 2015. They used in their work cointegration analysis, VAR Model and Granger causality tests. Empirical results indicated that exports and imports cause

economic growth, and they are the only source of growth in Panama. Bakari (2016) searched the nexus between exports, imports, and economic growth in the case of Canada during the period 1990 – 2015. In his empirical analysis, he found that exports and imports cause economic growth. In the case of Germany, Bakari (2017a) searched the nexus between trade and economic growth over the period 1985 – 2015. By using cointegration analysis, VAR Model and Granger Causality Tests, empirical results indicated that exports and imports cause economic growth. In the case of Japan, Bakari (2017b) found that exports have a positive effect on economic growth, but he found that imports don't have any effect on economic growth for the period 1970 – 2015. Bakari (2018b) searched the causality link between exports, imports, and economic growth in Tunisia during the period 1965 – 2016. He found that exports have a negative effect on economic growth. However, he found that imports have a positive effect on economic growth in the long run. He indicated that trade policies in Tunisia are not adequate and robust for the Tunisian context. Fakraoui and Bakari (2019) searched the nexus between exports, domestic investment and economic growth in the case of India for the period 1960 – 2017. Using cointegration analysis and VECM Model, they found that there is no relationship between exports, domestic investment and economic in the long run. However, empirical results indicate that in the short run, exports cause economic growth. In the case of Brazil, Bakari et al (2019) searched the relationship between exports, imports and economic growth during the period 1970 – 2017. By using cointegration analysis, VECM Model and Wald tests, empirical results indicate that in the long run exports and domestic investment have a positive effect on economic growth. However, the impact of imports is negative. In the short run, they found that exports, domestic investment and imports cause economic growth. Kong et al (2020) examined the link between trade openness and economic growth in the case of China. Using the ARDL model, they found that there is a positive bidirectional relationship between trade openness and economic growth in both long run and short run. In the case of 42 countries in sub-Saharan Africa (SSA), Zahonogo (2017) investigated the link between trade openness and economic growth. He concluded that openness is detrimental to economic growth. Using the same ARDL approach, Lawal et al. (2016) draw the same conclusion for Nigeria. Similarly, Vlastou (2010) finds a negative effect of openness on growth for some African countries.

Bakari and Tiba (2019a) found that trade openness has a positive impact on economic growth for the case of 24 Asian countries. In their work, they used annual data over the period 2002 – 2017 and static gravity model. Again, with Bakari and Tiba (2019b) examined the determinants of economic growth in United States America over the period 1970 – 2016. By using

cointegration analysis and Vector Error Correction Model, they found that in the long run exports have a positive effect on economic growth. However, imports have a negative effect on economic growth in the long run. Bakari (2021a) searched the impact of exports and imports on economic growth in the case of Spain during the period 1970 – 2017. By using VECM Model, he found that exports have a positive impact on economic growth in the long run. However, imports have a negative effect on economic growth in the long run. Also, results indicated that exports and imports have not any effect on economic growth in the short run.

Over the period 1963 to 2013, Tang et al. (2019) studied the relationship between trade openness and economic growth in Mauritius. The results show that trade openness has a positive impact on economic growth. In the case of Nigeria, Nwadike et al. (2020) looked for the impact of trade openness on economic growth during the period 1970 - 2011. They found that trade openness has a significantly positive impact on economic growth. In the context of Ghana, Duodu et al. (2020) examined the impact of trade openness on economic growth using the ARDL model. During the period 1984 - 2018, empirical results have shown that trade openness has a significantly positive impact on economic growth. Malefane (2020) examined the impact of trade openness on economic growth in South Africa. They found that trade openness has a strong and positive impact on economic growth. In the case of Madagascar, Rasoanomenjanahary et al (2022) examined the impact of trade openness on economic growth for the period from 1993 to 2020 using an estimate based on the vector error correction model. The empirical results confirmed that trade openness has a negative effect on economic growth in Madagascar.

2.2.Digitalization and economic growth

Digitalization, typically depicted by the Internet, big data, and artificial intelligence, is speeding up profound integration with industries, leading the world into the era of the digital economy. In fact, digitalization has also progressively gone through a vital part of cooperation for countries. Digitalization can further optimize the industrial structure and create jobs through information and communication technology (ICT), Internet and other intelligent means, greatly increasing the economic development of countries. In recent years, the digital economy has become a new economic form after the agricultural and industrial economies {see: Dahmani et al (2021); Dahmani et al (2022a, 2022b)}. Previous investigations have expose that the digital economy is well-respected the principal driver of economic growth and sustainable development in both developed and developing countries. For example, Salahuddin et al. (2015)

estimated the short- and long-term effects on economic growth using Australia's annual time series for the period 1985 to 2013. ARDL estimates suggest a significant long-term positive relationship between digitization and economic growth. On the other hand, the short-term link between economic growth and digitalization is not significant. Tripathi and Inani (2016) use a panel autoregressive distributed lag (ARDL) model for the period 1998 to 2014 to study the long- and short-term relationship between digitization and economic growth in 42 countries in sub-Saharan Africa. The results show that digitalization has a positive and significant impact on long-term economic growth. In the short term, however, digitalization can negatively impact economic growth. Rahimi and Rad (2017) attempted to estimate the short- and long-term relationship between Internet use and economic growth using panel data from eight developing countries over the period 1990-2013. and Dumitrescu-Hurlin causality. test. Empirical results show that digitalization is a source of economic growth. However, economic growth has no impact on digitization. Pradhan et al. (2013) examined the relationship between digitization and economic growth in 34 OECD countries between 1990 and 2010. They used panel cointegration and panel Granger causality. The team's cointegration analysis shows that digitization and economic growth are cointegrated. The Granger panel causality test also shows that there is a bidirectional causal relationship between digitization and economic growth. Choi and Yi (2009) examine the impact of digitization on economic growth in 207 countries between 1991 and 2003. They used pooled OLS, panel GMM, random effects and fixed effects. All estimates indicate that digitalization plays a positive and important role in economic growth. Choi and Yi (2017) used panel data analysis (pooled OLS, fixed effects, random effects, and GMM) to examine the impact of digitization on economic growth in 105 countries over the period 1994-2014. Empirical results show that digitalization has a positive impact on economic growth. Saidi and Chebli (2017) examine the causal relationship between digitization and economic growth in high-income countries using a panel dataset from 1990 to 2015. Empirical results from the d-vector panel error correction model (PVECM) show that there is a one-way relationship from digitization to economic growth. Similarly, Kalal et al. (2021) used time series data for the period 1997-2015 in Tunisia. They found that ICT had a positive long-term effect on economic growth but a negative short-term effect.

Bakari (2021b) investigated the impact of innovation and digitalization on economic growth in the case of 76 developed and developing countries for the period 1995 – 2016. By using cointegration analysis and Panel ARDL, empirical analysis indicate that digitalization and innovation have a positive impact on economic growth in the long run. Indeed, a 1% increase

in digitalization leads 0.001638% increase in economic growth. Bakari (2021c) examined the effect of digitalization on the relationship between domestic investment and economic growth in the case of G7 Countries during the period 1991–2018. Empirical analysis proved that domestic investment affects positively on economic growth, however the Internet doesn't have any effect on economic growth. Also, the effect of domestic investment on economic growth proves to be not affected by the Internet. Also, Bakari and Tiba (2020) treated the impact of digitalization on growth for a sample in the case of 4 North African economies (Algeria, Egypt, Morocco and Tunisia) over the period 1995-2017 using various techniques such as ARDL Limits Testing Approach, ARDL Panel Model, Fixed Effects OLS, Random effect OLS, FMOLS, 2 SLS, RLS, GLM and GMM. Indeed, for the time series results, the ARDL highlights reported the presence of a negative impact of the Internet on economic growth in Algeria, Egypt, Morocco, and Tunisia. Also, the main results of the Panel's data models confirm that the Internet exerts a significant negative impact on the growth of North Africa as a whole.

Jin and Jin (2014) examined the impact of online education on economic growth using a representative sample of 36 high-income countries. The regression results show that digitalization has a positive and significant impact on economic growth. Maurseth (2018) took over Choi and Yi (2003) and extended it to 2015. He found that digitalization has a significant negative impact on economic growth. Noh and Yoo (2008) studied the impact of digitization on economic growth in 60 countries over the period 1995-2002 and was collected for a test analysis survey. Panel estimates show that the implicit growth impact of digital transformation is negative for countries with high income inequality. In the case of Tunisia, Bakari et al (2020) examined the three-way linkage between innovation, digitalization, and economic growth during the period 1985 – 2018. By employing cointegration analysis and ARDL Model, they found that digitalization and innovation have a negative incidence on economic growth in the long run. In the short run, they found that digitalization causes economic growth. Also, they found that there is a positive bidirectional causality between innovation and digitalization in the long run.

3. Data and Methodologies

The selected countries respect the ranking and analysis of the World Bank. The sample includes Richest Asian Countries depending on the availability of data. In total, our sample comprises 10 countries (China, Inde, Japan, Thailand, Indonesia, Pakistan, Saudi Arabe, South Korea, Turkey, and Iran), and the estimation period is from 1990 to 2020. To Study the impact of

digitalization and trade openness on economic growth, we will apply a linear estimation of panel data that has five variables whose reason to clarify and properly determine this effect. The following table defines the variables and the data source of each variable.

Table 1: Description of variables

No	Variable	Description	Source
1	Y	Gross domestic product (constant US $)	The World Bank / Perspective Monde
2	K	Gross fixed capital formation (constant US $)	The World Bank / Perspective Monde
3	L	Labor Force	The World Bank
4	I	Individuals using the Internet	The World Bank
5	T	Trade Openness (Constant US $)	The World Bank

Source: built by authors

To determine the effect of impact of digitalization, trade openness on economic growth in our case, we will apply an estimate based on a production function that describes the situation of countries characterized by an open economy. The basic model is written and modeled as follows:

$$\mathbf{Y = F\,(K, L;\ I, T)}\quad \mathbf{(1)}$$

$$\mathbf{Y_{it} = A\ K^{\beta_1}\ L^{\beta_2}\ I^{\beta_3}\ T^{\beta_4}}\quad \mathbf{(2)}$$

$$\mathbf{Log(Y_{it}) = Log(A) + \beta_1 Log(K_{it}) + \beta_2 Log(L_{it}) + \beta_3 Log(I_{it}) + \beta_4 Log(T_{it}) + \varepsilon_{it}}\quad \mathbf{(3)}$$

$$\mathbf{Log(Y_{it}) = \beta_0 + \beta_1 Log(K_{it}) + \beta_2 Log(L_{it}) + \beta_3 Log(I_{it}) + \beta_4 Log(T_{it}) + \varepsilon_{it}}\quad \mathbf{(4)}$$

The augmented production function including all these variables is expressed in equation (2): {'A' shows the level of technology utilized in the country which is assumed to be constant. The returns to scale are associated with capital (K), labor force (L), digitalization (I) and trade openness (T), which are shown by β_1 ,β_2, β_3 and β_4 respectively. In equation (3), we can see that all variables in the rhyme are converted to logarithms, thus inventing the nonlinear form of the Cobb-Douglas production linearly. Finally, we keep the technique unchanged, as shown in Equation (4). According to Bakari and Mabrouki (2017); Bakari and Tiba (2019), the static gravity model remains an eclectic model for empirical research on international trade. In our case, the base model is written and modeled as follows:

$$\mathbf{log(Y)_{it} = \alpha_{1i} + \beta_{1i} log(X)_{it} + \gamma_i + \varepsilon_t}\quad \mathbf{(5)}$$

Where, 'Y' is the variable that design economic growth, 'X' design control variables, 'γ' is a country-specific effect not observed, 'ε' is the term error, 'i' is the individual dimension of the panel (the country) and 't' is the temporal dimension.

In theory, the problem is that the equations should be defined in terms of methods for panel data with fixed individual effects or random individual effects. Our goal is not to reveal the entire theory of different forms of individual effects or different types of norms in the context of panel data analysis. We will attempt to describe the two most used single effects in the literature, fixed effects, and random effects. The Hausman test is the most used theoretical solution for determining which of two types of estimates (fixed effects or random effects) is most appropriate. In this case, the fixed-effects model is significant and retained if the probability of the Hausman test is at least 5%. However, if the probability of the Hausman test is greater than 5%, the random effects model is significant and retained.

Formalized by Hansen (1982), GMM estimation has become one of the most widely used model estimation methods in economic and financial analysis. In fact, some studies such as Felbermayr et al. (2011) and Ulasan (2015) found the model to be very effective in empirical work dealing with the effects and determinants of international trade. To estimate the GMM in our model, we need additional lagged dependent variables to account for endogeneity bias. Therefore, we consider the GMM method equation. Regression equations will be as follows:

$$\mathbf{log(Y)_{it}} = \boldsymbol{\alpha_{1i}} + \boldsymbol{\beta_{1i}}\mathbf{log(Y)_{it-1}} + \boldsymbol{\gamma_{1i}}\mathbf{log(X)_{it}} + \boldsymbol{\mu_i} + \boldsymbol{\varepsilon_{it}} \qquad \mathbf{(6)}$$

Where 'Y' is the variable that design economic growth, 'X' design control variables, $\log(Y)_{it-1}$ is the lagged variable of $\log(Y)_{it}$; α , β and γ are the parameters to be estimated; μ_i represents the individual effects; t denotes the time; and ε_{it} designates the model error term.

When applying this technique, we will use estimates based only on GMM regression. We then define the GMM model equations according to the panel data approach with fixed single effects or random single effects. Finally, we will use the Hausman test to determine which of the two types of estimates (fixed effects or random effects) is more appropriate. In this case, the fixed-effects GMM model is significant and retained if the probability of the Hausman test is at least 5%. However, if the probability of the Hausman test is greater than 5%, the GMM random effects model is significant and retained. As soon as we have our empirical methodology and our estimation strategy, we move on to the next section which presents our empirical results.

4. Empirical Results

This section presents our empirical results. In fact, it includes the descriptive statistics, the equality tests, the estimates of the static gravity model and the estimates of the GMM models. We begin with the analyzes of the descriptive statistics.

4.1.Descriptive statistics

Before presenting any empirical results, there is some pre-testing of the data that is often considered important to provide some hypothesis or information about the correlation of the target variable. According to Table 1, the probability of rejection for all variables was less than 5%, indicating that they were considered during the study. Skewness and kurtosis, other statistical measures, reflect whether the variable of interest follows a normal distribution. Skewness alone measures the strength of outliers. All given variables are positively skewed. In terms of kurtosis, it measures the peak or flatness of the target variable relative to a normal distribution. The kurtosis coefficient values for all variables reflects peak values. Overall skewness and kurtosis coefficients confirm that the variables follow a normal distribution.

Table 1: Descriptive statistics

	Y	K	L	I	T
Mean	1.48E+12	5.13E+11	1.50E+08	29649532	6.42E+11
Median	5.39E+11	1.85E+11	38951379	5284141.	3.40E+11
Maximum	1.46E+13	6.37E+12	8.00E+08	5.60E+08	5.13E+12
Minimum	9.95E+10	2.00E+10	5127874.	6.701180	3.49E+10
Std. Dev.	2.32E+12	9.53E+11	2.31E+08	79283040	9.26E+11
Skewness	3.212697	3.962140	1.828885	4.484125	3.167869
Kurtosis	14.93635	20.27015	4.889525	23.95342	13.41660
Jarque-Bera	2373.595	4663.593	218.9321	6709.890	1920.026
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	4.59E+14	1.59E+14	4.65E+10	9.19E+09	1.99E+14
Sum Sq. Dev.	1.67E+27	2.81E+26	1.65E+19	1.94E+18	2.65E+26
Observations	310	310	310	310	310

Source: Authors' calculations using EViews 11 software

4.2.Panel quality test

In statistics, quality test analysis is a set of statistical models used to check whether group means come from the same population. The groups correspond to the categories of a qualitative variable and the means are calculated from a continuous variable.

This test applies when measuring one or more categorical explanatory variables (then called variability factors, their different modalities being sometimes called “levels”) which have an influence on the law of a continuous variable to be explained. One speaks of one-factor analysis when the analysis relates to a model described by a single factor of variability, of two-factor analysis or of multifactorial analysis otherwise. The results of table n°2 show that all the quality tests have probabilities lower than 5%. This means that our variables can be estimated within the framework of statistical panel data.

Table n°2: Tests for Equality

Test for Equality of Means Between Series			
Method	Df	Value	Probability
Anova F-test	(4, 1545)	80.07017	0.0000
Welch F-test*	(4, 648.592)	109.6728	0.0000
Test for Equality of Variances Between Series			
Method	Df	Value	Probability
Bartlett	4	11107.60	0.0000
Levene	(4, 1545)	129.1236	0.0000
Brown-Forsythe	(4, 1545)	54.01572	0.0000
Test for Equality of Medians Between Series			
Method	Df	Value	Probability
Med. Chi-square	4	1112.258	0.0000
Adj. Med. Chi-square	4	1104.274	0.0000
Kruskal-Wallis	4	1201.294	0.0000
Kruskal-Wallis (tie-adj.)	4	1201.294	0.0000
Van der Waerden	4	1084.569	0.0000

Source: Authors' calculations using EViews 11 software

4.3.Estimation of static gravity model

The results of the estimation of the static gravity model are presented in Table 3. The static fixed-effect gravity model shows us that capital, labor force, digitalization and trade openness have a positive effect on economic growth. In fact, the fixed-effect model indicates that a 1% increase in digitalization leads to a 0.013383% increase in economic growth. Similarly, a 1% increase in trade openness leads to a 0.459010% increase in economic growth in Asia.

For the estimation of the random-effect gravity model, the results indicate that capital, labor force, digitalization and trade openness have a positive impact on economic growth. In fact, the random-effects model indicates that a 1% increase in digitalization leads to a 0.014393% increase in economic growth. Similarly, a 1% increase in trade openness leads to a 0.457352% increase in economic growth in Asia.

Table n°3 : Estimation du modèle de gravité statique

Dependent Variable: LOG(Y)						
Method	**POLS**		**Fixed Effect Model**		**Random Effect Model**	
Variable	***Coefficient***	***Prob.***	***Coefficient***	***Prob.***	***Coefficient***	***Prob.***
C	4.254606	0.0000***	5.806462	0.0001***	6.260373	0.0000***
LOG(K)	0.469595	0.0000***	0.146308	0.0000***	0.153080	0.0000***
LOG(L)	0.075554	0.0001***	0.297014	0.0001***	0.263397	0.0000***
LOG(I)	0.014496	0.0251***	0.013383	0.0053***	0.014393	0.0009***
LOG(T)	0.348774	0.0000***	0.459010	0.0000***	0.457352	0.0000***
Note: *** indicates significance at 1%.						

Source: Authors' calculations using EViews 11 software

To check which model will be chosen in our analysis, we will apply the Hausman test in table 4. The latter has a probability greater than 5%. This means that the random-effect static gravity model will be retained. In this case, we confirm that digitalization and trade openness are a source of economic growth in Asia.

Table 4: Hausman test of Gravity static model

Correlated Random Effects - Hausman Test			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	6.193578	4	0.1852

Source: Authors' calculations using EViews 11 software

4.4.Estimation of GMM Model

The results of the estimation of the GMM model are presented in Table 5. The GMM model in fixed effect shows us that capital, labor force, digitalization and trade openness have a positive effect on economic growth. In fact, the fixed-effect model indicates that a 1% increase in digitalization leads to a 0.011820% increase in economic growth. Similarly, a 1% increase in trade openness leads to a 0.466000% increase in economic growth in Asia.

For the estimation of the random-effect GMM model, the results indicate that capital, labor force, digitalization and trade openness have a positive impact on economic growth. In fact, the GMM model in random effects indicates that a 1% increase in digitalization leads to a 0.013093% increase in economic growth. Similarly, a 1% increase in trade openness leads to a 0.460565% increase in economic growth in Asia.

Table n°5: Estimation of GMM Model

Dependent Variable: LOG(Y)						
Methods	**GMM**		**GMM Fixed Effect Model**		**GMM Random Effect Model**	
Variable	***Coefficient***	***Prob.***	***Coefficient***	***Prob.***	***Coefficient***	***Prob.***
C	4.632443	0.0000	5.328525	0.0009	5.818243	0.0000
LOG(K)	0.550948	0.0000	0.173770	0.0000	0.184505	0.0000
LOG(L)	0.054475	0.0056	0.274514	0.0008	0.238525	0.0001
LOG(I)	0.018092	0.0098	0.011820	0.0380	0.013093	0.0092
LOG(T)	0.267030	0.0000	0.466000	0.0000	0.460565	0.0000
Note: *** indicates significance at 1%.						

Source: Authors' calculations using EViews 11 software

To check which GMM model will be chosen in our analysis, we will apply the Hausman test in table 6. The latter has a probability greater than 5%. This means that the GMM Model in random effect will be retained. In this case, we confirm that digitalization and trade openness are a source of economic growth in Asia.

Table 6: Hausman test of GMM model

Correlated Random Effects - Hausman Test			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	4.283107	4	0.3690

Source: Authors' calculations using EViews 11 software

5. Conclusion

This study investigates the impact of digitalization and trade openness on economic growth for top ten richest Asian countries (China, Inde, Japan, Thailand, Indonesia, Pakistan, Saudi Arabe, South Korea, Turkey, and Iran) over the period 1990 - 2020. To do this, we applied a panel data analysis based on two models: Gravity Static Model and GMM Model. Our main question was, how does trade openness and digitalization on the growth of an economy?

The empirical results that estimations of the two models gave us the same results which prove the robustness of our results. Our empirical results show that digitalization and trade openness have a positive effect on economic growth. These results prove that trade openness and digitalization is a source of economic growth for richest Asian countries. This study contributes to the economic growth literature by providing new empirical evidence on how economic activities relate to digitalization and trade openness. The results of our study are important for policy makers, in terms of promoting trade openness, launching digitalization, and stimulating economic growth. Due to the magnitude of the positive externalities linked to trade openness and digitalization, in terms of technology transfer biases, financial capacities, economic policies, human expertise, abundant natural resources, markets for large size and ripple effects added to national capabilities and national investment, the pace of phenomenal economic performance of Asian economies is very well marked.

Digitization is a critical capability that underpins all other national economic efforts. The creation of digital markets and the stimulation of digitization can generate significant economic benefits and lead to substantial social benefits for societies and communities. Digitalization has

the potential to boost productivity, create new jobs and improve the quality of life for society. If policymakers in Asian countries want to capture these rich returns, they must figure out how they can build their digital markets where most of the world's information and goods will be bought and sold over the next decade of digitalization.

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