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The impact of trade openness on economic growth: The case of Cote d'Ivoire

Yaya Keho[1*]

Abstract: The relationship between trade openness and economic growth has been extensively investigated yielding to mixed and inconclusive results. This might be attributed to the omission of the role of capital stock and labor in the trade-growth nexus. This paper examines the impact of trade openness on economic growth for Cote d'Ivoire over the period 1965–2014 in a multivariate framework including capital stock, labor and trade openness as regressors. It uses the Autoregressive Distributed Lag bounds test to cointegration and the Toda and Yamamoto Granger causality tests. The results show that trade openness has positive effects on economic growth both in the short and long run. Furthermore, they reveal a positive and strong complementary relationship between trade openness and capital formation in promoting economic growth.

Subjects: Econometrics; International Trade (incl. trade agreements & tariffs); Development Economics

Keywords: economic growth; trade openness; cointegration; Cote d'Ivoire

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*Corresponding author: Yaya Keho, Department of Applied Economics, Ecole Nationale Supérieure de Statistique et d'Economie Appliquée (ENSEA), 08 BP 03 Abidjan 08, Abidjan, Côte d'Ivoire
E-mail: yayakeho@yahoo.fr

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Additional information is available at the end of the article

1. Introduction

Since the works by Grossman and Helpman (1990), Romer (1990) and Young (1991), the role of trade in promoting economic growth has stimulated a growing body of economic studies. The question is whether trade acts as an engine for economic growth, as stated by the trade-led growth hypothesis.

ABOUT THE AUTHOR

Yaya Keho, PhD is currently Professor of Econometrics and Statistics at the National School of Statistics and Applied Economics (ENSEA) of Abidjan, Côte d'Ivoire. He earned his PhD in Economics from the University of Saint Quentin-en-Yveline, at France. He has taught at many Universities in Africa (Cote d'Ivoire, Benin, Burundi, Cameroon, Senegal). Prof KEHO has published in many international revues like *South African Journal of Economics, Energy Policy, Energy, International Economic Journal, Empirical Economic Letters, Economics Bulletin, International Journal of Energy Economics and Policy, International Journal of Statistics and Economics, Journal of Statistical and Econometric Methods, International Journal of Economics and Finance, International Journal of Business and Economics, Asian Economic and Financial Review, Asian-African Journal of Economics and Econometrics.* His research interests focus on public finance, energy economics, international economics and applied econometrics.

PUBLIC INTEREST STATEMENT

Openness to international trade has influences on economic growth. However, there are studies that support both negative and positive impact, with very scanty literature from Sub-Saharan Africa most especially Cote d'Ivoire. The findings of this study indicate a positive and strong complementary relationship between trade openness and capital formation in promoting economic growth. This result can be useful for analyzing trade policies and economic growth in other African economies with similar characteristics as Cote d'Ivoire.

It has been shown that in the long-run, trade openness can potentially enhance economic growth by providing access to goods and services, achieving efficiency in the allocation of resources and improving total factor productivity through technology diffusion and knowledge dissemination (Barro & Sala-i-Martin, 1997; Rivera-Batiz & Romer, 1991). It is therefore expected that countries with more trade openness will relatively outperform those with less openness. From this perspective, developing countries have much to gain by trading with advanced countries. It is mainly in view of these expected gains that international institutions and donor governments routinely recommend trade liberalization policies to developing countries in the hope of opening up and integrating them into the global market. These policies were fueled by the failure of import-substitution industrialization strategy and also by findings from empirical studies showing that more outward-oriented economies record higher economic growth rates. Furthermore, the spectacular success of East Asian economies was partly attributed to their early openness to trade (Stiglitz, 1996; World Bank, 1993). It is not surprising that in the late 1970s, many developing countries have adopted trade liberalization reforms involving the reduction of import and export tariffs and non-tariff barriers. However, another strand of research argues that increase in trade openness may be detrimental to economic growth by increasing inflation and lowering exchange rates (Cooke, 2010; Jafari Samimi, Ghaderi, Hosseinzadeh, & Nademi, 2012). Trade openness may impact economic growth negatively for countries which specialize in production of low-quality products (Haussmann, Hwang, & Rodrik, 2007). For instance, countries exporting primary products are vulnerable to terms of trade shocks. Despite these conflicting views, the general belief is that openness to international trade is beneficial to economic development, especially for developing countries.

A number of studies point to positive growth effects of trade openness (e.g. Chang, Kaltani, & Loayza, 2009; Dollar & Kraay, 2004; Frankel & Romer, 1999; Freund & Bolaky, 2008). Other studies contradict the existence of a positive link between trade and economic growth (e.g. Musila & Yiheyis, 2015; Polat, Shahbaz, Rehman, & Satti, 2015; Ulaşan, 2015; Vlastou, 2010). The mixed results from the empirical literature might be attributed to the econometric techniques, the sample of countries, and the indicator used as proxy for trade openness. Most of existing studies employ panel data regression approaches that impose cross-sectional homogeneity on coefficients, with the hope that the results could be applied to all countries. The cross-sectional homogeneity assumption is likely to be violated given the heterogeneity of economies with respect to trade policy, economic conditions and technological and institutional developments. What do Burundi, Kenya, Mali, India, and France have in common to be included into a same panel data analysis?

The objective of this study is to examine the link between trade openness and economic growth in Cote d'Ivoire using a multivariate framework. Cote d'Ivoire recorded a remarkable economic success from 1960 to 1979, with a growth rate averaging 6.5% and trade openness accounting for 70.2% of GDP. This impressive economic performance was attributed mainly to political stability, favorable terms of trade, and massive public investment. The 1980s brought with a decline in economic growth which became negative in many years. Over the period 1980–1993, the economic growth rate averaged −0.3% and the share of exports plus imports in GDP accounted for about 67.3%. Structural transformation of the economy also slowed down during this period. The weak growth that characterized the Ivorian economy from 1980 to 1993 has been blamed largely on external shocks and structural weaknesses in the economy. From 1999, the country experienced a period of political uncertainty leading to political tension that lasted from 1999 to 2011. The economy suffered from this situation. With the end of conflict in April 2011 and the return of peace, the country is experiencing an impressive economic revival and a rebuilding of its capital stock through public investment in infrastructures. The economic growth rate and trade performance have reached 9 and 87%, respectively, over the period 2012–2014. The recent performance in economic growth and trade spark some questions: is a significant part of economic growth trade-led? If yes, is trade-led growth a long-run or short-run phenomenon? The study will try to address these questions. The hypothesis to be tested in this study is that trade has a positive impact on economic growth in Cote d'Ivoire. The study employs the Autoregressive Distributed Lag (ARDL) bounds test of Pesaran, Shin, and Smith (2001) to depict the long-run relationship between trade and economic growth. Further, it applies

the Granger-causality test suggested by Toda and Yamamoto (1995) to unravel the causal relationships among the variables. These approaches are more reliable in studies involving variables integrated of different orders.

The remainder of the paper is organized as follows. Section 2 provides a review of the literature regarding the trade-growth nexus. Section 3 outlines the model, data and econometric methodology. Section 4 discusses the empirical results. Finally, Section 5 summarizes the main findings of the study and provides some policy recommendations.

2. Literature review

The relationship between trade openness and economic growth has received a great deal of attention both in the theoretical and empirical literature during the last three decades. However, there is no consensus on whether greater openness to trade stimulates economic growth. According to the theory of comparative advantage, if a country wants to trade with another country the latter will produce goods in which it has a comparative advantage. It specializes in the sector for which it has better factor endowments and produces goods on a larger scale. As a result, productivity and exports of this sector will go up and this will boost the overall economic growth. This theory has been further extended by other economists. Krueger (1978) and Bhagwati (1978) argue that trade liberalization encourages specialization in sectors which have economies of scale that contribute to improve the efficiency and productivity in long-run. New endogenous growth models explain a positive relationship between trade openness and economic growth as the result of the international diffusion of advanced technologies (Coe & Helpman, 1995; Grossman & Helpman, 1991a; Romer, 1994). A country with a higher degree of openness has a greater ability to use technologies generated in advanced economies, and this capability leads them to grow more rapidly than a country with a lower degree of openness. Edwards (1998) argues that the cost of imitation also matters in the trade-growth relationship. If the imitation cost of innovation in the poorer countries is lower than that in advanced economies, the poorer countries will grow faster than the advanced ones and there will be a tendency toward convergence. All these arguments suggest that developing economies have much to gain from international trade with technologically advanced nations. However, some opposite arguments point out that trade openness may be detrimental to economic growth. This is the case when the country specializes in sectors where research and development activities are not the core ones (Almeida & Fernandes, 2008). Moreover, trade composition in terms of goods also matters regarding its growth effect (Haussmann et al., 2007; Kali, Méndez, & Reyes, 2007). Whether or not a country gains from international trade also depends on the ease with which foreign technologies are mastered and adapted to the local environment (Grossman & Helpman, 1991b).

On the empirical front, a growing literature has examined the relationship between trade and economic growth. The evidence from this literature is mixed and conflicting across methodologies and countries. The studies by Bahmani-Oskooee and Niroomand (1999), Frankel and Romer (1999), Karras (2003), Yanikkaya (2003), Dollar and Kraay (2004), Wang, Liu, and Wei (2004), Freund and Bolaky (2008), Das and Paul (2011), Marelli and Signorelli (2011), Nowbutsing (2014) and Zarra-Nezhad, Hosseinpour, and Arman (2014) confirm the positive impact of trade on economic growth. In contrast, Vamvakidis (2002) and Ulaşan (2015) find no support for the trade-led growth hypothesis. Rigobon and Rodrik (2005) find a significant negative impact of trade on income levels. Fenira (2015) finds a weak relationship between trade openness and economic growth. Rassekh (2007) investigates the trade-growth nexus for 150 countries and finds that lower income countries benefit more from international trade as compared to higher income economies. In a study of 82 countries, Chang et al. (2009) report a positive relationship between trade openness and economic growth. Kim and Lin (2009) apply the instrument-variable threshold regression approach to 61 countries and find an income threshold level above which greater trade enhances economic growth. Below the threshold level, however, trade openness has detrimental effects on growth. Afzal and Hussain (2010) find no causal relationship between exports and economic growth as well as between imports and economic growth in Pakistan. This finding has been challenged by Klasra (2011) and Shahbaz (2012) who confirm the trade-led growth hypothesis for Pakistan. Dufrenot, Mignon, and

Tsangarides (2010) apply the quantile regression approach to explore the trade-growth nexus for 75 developing countries. Their results indicate that the effect of openness on economic growth is higher in low-growth countries relative to high-growth countries. The low-growth economies include countries from all the continents, but a majority is in Africa (Benin, Cote d'Ivoire, Madagascar, and Zambia) and Latin America. Kim, Lin, and Suen (2011) use instrumental variable threshold regressions to examine whether the trade-income relationship varies with the level of economic development. Their results show that trade openness has positive effects on financial development, capital accumulation, and economic development in high-income countries. In low-income countries, however, the effect is negative and significant. Kim (2011) shows that openness to trade has positive effects on economic growth and real income in developed countries but negative effects in developing countries. Furthermore, the real effect of trade also depends on the level of financial development and inflation. Openness to trade has negative effect on growth in countries with low financial development, but has insignificant impact in countries with high financial development. Trade openness is conducive to economic growth in low-inflation countries but has insignificant impact on growth in high-inflation countries. Kim, Lin, and Suen (2012) provide evidence that trade promotes economic growth in high-income, low-inflation, and non-agricultural countries but has a negative impact in countries with the opposite attributes. For a panel of 46 countries, Huang and Chang (2014) find that the growth effect of trade depends on the extent of stock market development. Trade enhances economic growth only when the country reaches a threshold level of stock market development. Sakyi, Villaverde, and Maza (2015) provide evidence of positive bi-directional causal relationship between trade and economic growth for a sample of 115 developing countries. Were (2015) finds that trade exerts a positive and significant effect on economic growth rate in developed and developing countries, but its effect is not significant for least developed countries which largely include African countries. In a study of China, Hye, Wizarat, and Lau (2016) show that trade openness is positively related to growth in the long and short run.

Regarding the Sub-Saharan African countries the evidence is also mixed. Deme (2002) validates the trade-led growth hypothesis for Nigeria. Chang and ying (2008) confirm the positive growth effects of trade and air freight for a sample of Economic Commission for Africa (ECA) countries. Gries, Kraft, and Meierrieks (2009) investigate the case of 16 Sub-Saharan African countries and do not find significant long-run relationships among the variables for most of the sample. They also provide evidence that economic growth causes trade openness in Ethiopia, Gabon, Kenya, Mauritius, Senegal, Sierra Leone, and Togo, whereas a feedback causal relationship exists for Cameroon, Cote d'Ivoire, Nigeria and Rwanda. On the contrary, no causal relationship between trade and growth was found for Burundi, Ghana, Madagascar, South Africa, and Gambia. For a sample of 34 African countries, Vlastou (2010) finds that openness to trade has a negative impact on economic growth. He also reports a causal relationship running from openness to growth. In a study of 27 African least developed countries, Tekin (2012) finds no significant causality between foreign aid, trade openness and real per capita GDP. Asfaw (2014) analyses the impact of trade liberalization on economic growth in a sample of 47 Sub-Saharan African countries. The results reveal that openness to trade stimulates both economic growth and investment. Besides, trade policies such as average weighted tariff rate and real effective exchange rate affect economic performance through trade. Menyah, Nazlioglu, and Wolde-Rufael (2014) investigate the causal nexus among financial development, trade openness and economic growth for 21 Sub-Saharan African countries. They find limited support for the trade-led growth hypothesis. The trade-led growth hypothesis holds only for Benin, Sierra Leone, and South Africa.

In a more recent work, Brueckner and Lederman (2015) employ the instrumental variable approach to a panel of 41 Sub-Saharan African countries. They find that trade openness increases economic growth both in the short and long run. Musila and Yiheyis (2015) investigate the case of Kenya and find that trade openness has positive effect on investment ratio but not on the rate of economic growth. Polat et al. (2015) find that trade openness impedes economic growth in South Africa. Finally, Lawal, Nwanji, Asaleye, and Ahmed (2016) apply the ARDL methodology to Nigeria and find a negative long-run impact of trade openness on economic growth but a positive growth effect in the short run. Further, a two-way causality was found between the two variables.

3. Model, data, and methodology

3.1. Model and data

The hypothesis to be tested in this study is that trade openness stimulates economic growth in Cote d'Ivoire. To test this hypothesis, we start with Cobb–Douglas production function combining capital and labor as follows:

$$Q_t = A_t K_t^{\alpha} L_t^{1-\alpha} \tag{1}$$

where Q is real economic output, K is capital stock, L is labor force, and A is technological progress. We extend this production function by assuming that technological progress can be influenced by trade openness. This leads us to specify A as follows:

$$A_t = \phi \mathrm{OP}_t^{\delta_1} Z_t^{\rho} \tag{2}$$

where OP stands for trade openness and Z represents other factors that may influence the state of technology. Substituting Equation (2) into Equation (1), gives:

$$Q_t = \phi \mathrm{OP}_t^{\delta_1} K_t^{\alpha} L_t^{1-\alpha} Z_t^{\rho} \tag{3}$$

Diving both sides by labor and taking logs, Equation (3) can be modeled as follows:

$$y_{it} = \theta_0 + \theta_1 K_{it} + \theta_2 L_{it} + \theta_3 \mathrm{OP}_{it} + \mu_{it} \tag{4}$$

where y, K, L, OP represent the log of real GDP per capita, log of real capital stock per capita, log of labor force, and log of real trade per capita, respectively.

The capital stock series is computed from the gross fixed capital formation figures using the perpetual inventory model which is: $K_t = I_t + (1 - \delta)K_{t-1}$ with an annual rate of depreciation of $\delta = 6\%$. The average growth rate (ρ) of investment over the sub-period 1965–1980 was used to generate the initial level of capital stock as $K_0 = I_0/(\rho + \delta)$. Earlier studies put too much emphasis on exports as measure for trade openness ignoring the role of imports. According to the theory of comparative advantage, trade leads to a more efficient use of domestic resources through the imports of capital goods and intermediate inputs that otherwise are too costly to produce locally (Yanikkaya, 2003). These goods are necessary for the production of exports in less developed countries. Thus, imports are as important as exports for economic growth in developing countries. Hence, in this study trade openness is measured as the sum of real exports per capita and real imports per capita. Real exports and imports have been computed on the basis of their respective shares in GDP. Population is used as proxy for labor force and to convert data in per capita terms. All data are in constant local currency and converted into natural logarithms. The data-set comes from the World Development Indicators and covers the period 1965–2014.

3.2. Econometric methodology

The empirical investigation involves three steps. The first step examines the stationarity of the variables using unit root tests. The second step tests the presence of long-run relationships between the variables. The third step is to carry out causal relationships among the variables using Granger causality tests. The ARDL approach to cointegration developed by Pesaran et al. (2001) is used to depict the long-run relationship among the variables. The advantages of this approach over other traditional methods are well documented in the econometric literature. The ARDL bounds testing approach to cointegration is based on the following error-correction model:

$$\Delta y_t = \phi_0 + \phi_1 y_{t-1} + \phi_2 \mathrm{OP}_{t-1} + \phi_3 Z_{t-1} + \sum_{i=1}^{m} \gamma_{1i} \Delta y_{t-i} + \sum_{i=0}^{n} \gamma_{2i} \Delta \mathrm{OP}_{t-i} + \sum_{i=0}^{p} \gamma_{3i} \Delta Z_{t-i} + e_t \tag{5}$$

where Δ is the difference operator and $Z = (K, L)$. Equation (5) is estimated using each variable as the dependent variable. The presence of long-run relationship is tested by restricting coefficients of

lagged level variables equal to zero. That is, the null hypothesis of no long-run relationship is: $\phi_1 = \phi_2 = \phi_3 = 0$. This hypothesis is tested through an *F*-test. The asymptotic critical values are provided by Pesaran et al. (2001) for large sample sizes. However, these critical values may not be appropriate for our case which has 50 observations. Therefore, we use the simulation procedure suggested by Pesaran et al. (2001) to generate exact critical values. Furthermore, the ARDL bounds testing procedure is sensitive to the selection of the lag structure (*m, n, p*). In this study, maximum lag length on each variable was set to five and the optimal lag structure was selected using the information criteria. The model has been tested by the diagnostic tests that are serial correlation, normality, and heteroskedasticity tests. Stability tests have also been used to test the goodness of fit of the ARDL model.

The ARDL approach tests whether or not a long-run relationship exists between the variables, but not the direction of causality. To provide information on the direction of causal relationships among the variables, we apply the Granger-causality approach suggested by Toda and Yamamoto (1995). This approach has the advantage of not requiring pre-testing for cointegration among the variables. It makes inference valid even when the variables are integrated of different orders. The basic idea of this approach is to artificially augment the correct VAR order, *p*, with *d* extra lags, where *d* is the maximum order of integration of the variables. Thus, the model VAR to be estimated is as follows:

$$\begin{bmatrix} y_t \\ \mathrm{OP}_t \\ Z_t \end{bmatrix} = \begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \end{bmatrix} + \sum_{i=1}^{p} \begin{bmatrix} \beta_{1i} & \gamma_{1i} & \delta_{1i} \\ \beta_{2i} & \gamma_{2i} & \delta_{2i} \\ \beta_{3i} & \gamma_{3i} & \delta_{3i} \end{bmatrix} \times \begin{bmatrix} y_{t-i} \\ \mathrm{OP}_{t-i} \\ Z_{t-i} \end{bmatrix} + \sum_{i=p+1}^{p+d} \begin{bmatrix} \beta_{1i} & \gamma_{1i} & \delta_{1i} \\ \beta_{2i} & \gamma_{2i} & \delta_{2i} \\ \beta_{3i} & \gamma_{3i} & \delta_{3i} \end{bmatrix} \times \begin{bmatrix} y_{t-i} \\ \mathrm{OP}_{t-i} \\ Z_{t-i} \end{bmatrix} + \begin{bmatrix} e_{1t} \\ e_{2t} \\ e_{3t} \end{bmatrix} \tag{6}$$

Once this augmented level VAR is estimated, a standard Wald test is applied to the first lagged *p* explanatory variables to make causal inference. The null hypothesis that trade openness does not cause GDP is $\gamma_{11} = \gamma_{12} = \ldots = \gamma_{1p} = 0$. Similarly, GDP does not cause trade openness if $\beta_{21} = \beta_{22} = \ldots = \beta_{2p} = 0$. The computed Wald-statistic has an asymptotic chi-square distribution with the degree of freedom equal to the number of constraints.

4. Empirical results and discussion

4.1. Descriptive statistics of the data

Figure 1 presents the trend of real GDP and trade openness during the sample period. We can see that the two variables present an upward trend until 1980 where economic crisis starts thus they decline in the following years. We also observe a decline in trade openness in 1994 the year of the devaluation of the CFA Franc currency.

Figure 1. Real GDP and trade openness over time, 1965–2014.

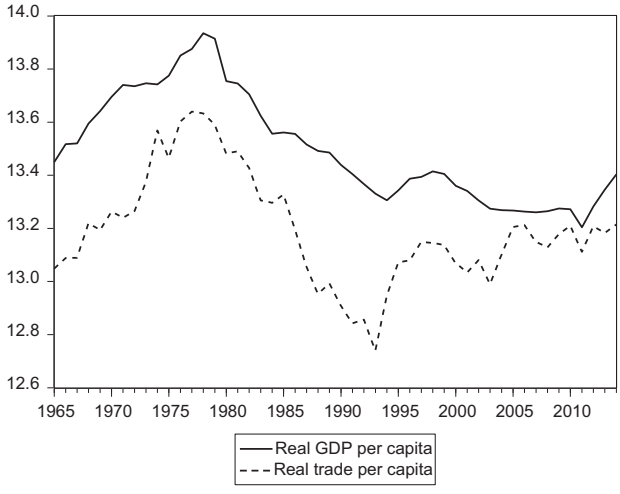

Table 1. Descriptive statistics and correlation matrix

Variables	ln GDP	ln *K*	ln *L*	ln OP
Panel A: summary statistics				
Mean	13.498	14.059	16.212	13.194
Median	13.444	13.982	16.296	13.180
Maximum	13.934	14.528	16.913	13.639
Minimum	13.204	13.698	15.255	12.739
Std. dev.	0.2030	0.2580	0.5020	0.2090
Interquartile range	0.3643	0.4027	0.8647	0.2251
Skewness	0.5160	0.3900	−0.3770	0.3990
Kurtosis	2.0770	1.9480	1.8680	2.8660
Jarque–Bera	4.0010	3.5710	3.8560	1.3650
Probability	0.1350	0.1670	0.1450	0.5050
Panel B: correlation matrix				
ln GDP	1.000			
ln *K*	0.793* (0.000)	1.000*		
ln *L*	−0.773* (0.000)	−0.512* (0.000)	1.000*	
ln OP	0.759* (0.000)	0.511* (0.000)	−0.389* (0.005)	1.000*

Note: Figures in parentheses are *p*-values.

*Indicates statistical significance at the 5% level.

Table 1 provides descriptive statistics and correlations of the variables. It can be observed that log of real GDP per capita has an average level of 13.5 and was at its highest peak in 1978 at 13.9. Trade openness in log averaged 13.2 and reached its maximum in 1977. It can also be observed that the probability values of the Jarque–Bera statistic suggest that our variables are normally distributed. The correlation matrix indicates a positive relationship between trade and GDP. However, correlation does not imply causality. A positive correlation between trade and GDP can be compatible with the trade-led growth hypothesis, the growth-led trade hypothesis or a two-way causality between trade and GDP. Does any causality exist between trade and GDP after controlling for capital and labor?

4.2. Unit root and cointegration tests

As a first step of our empirical analysis, we test for the order of integration of the series using the PP test of Phillips and Perron (1988) and the KPSS test of Kwiatkowski, Phillips, Schmidt, and Shin (1992). This step is necessary because the ARDL bounds test requires the dependent variable to be integrated of order one and the explanatory variables to be $I(0)$ or $I(1)$. If any variable is $I(2)$ then the *F*-test will provide biased results. The results displayed in Table 2 suggest that the variables are non-stationary in their levels but achieve stationary status after taking the first differences. This implies the possibility of long-run relationship among the variables.

Table 2. Results of unit root tests

Series	Level		First difference	
	PP	KPSS	PP	KPSS
GDP	−2.541	0.109	−4.418	0.179
K	−2.293	0.185	−1.181	0.164
L	0.083	0.242	−2.119	0.110
OP	−2.026	0.104	−6.560	0.132

Note: 5% critical values for PP and KPSS tests are −3.504 and 0.146, respectively.

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Table 3. Results of the ARDL cointegration test

Model	ARDL	*F*_stat.	Diagnostic tests		
			x^2 (Normality)	x^2 (Heteroscedasticity)	x^2 (Correlation)
GDP = *f*(*K*, *L*, OP)	ARDL(1,3,0,0)	7.969*	0.822	0.729	0.454
OP = *f*(GDP, *K*, *L*)	ARDL(1,5,5,0)	4.922*	0.656	0.634	0.247
K = *f*(GDP, *L*, OP)	ARDL(2,1,0,0)	4.878*	0.743	0.292	0.313
Level	Critical values (*T* = 50)				
	Lower bounds *I*(0)		Upper bounds *I*(1)		
5%	3.495		4.689		
10%	2.891		3.984		

Notes: Lag length on each variable is selected using the AIC criterion with maximum lag set to 5. Critical values are generated under the model with unrestricted intercept and no trend.

*Indicates the rejection of the null hypothesis of no cointegration at 5% level of significance.

The results of the ARDL bounds test are displayed in Table 3. From this table, we see that a compelling long-run relationship exists among the variables when regression is normalized in GDP, trade, and capital stock. In each case, the computed *F*-statistic exceeds the upper critical value at 5% level of significance. At the 5% significance level, all diagnostic tests do not exhibit any evidence of violation of the classical linear regression model assumptions.

After finding the existence of cointegration between the variables, we further estimate the long-run effects of capital, labor, and trade openness on economic growth. We estimate the long-run relationship using ARDL, Fully Modified OLS, and Dynamic OLS methods. The results are disclosed in Table 4. All estimated coefficients are statistically significant and have correct signs as expected. The results indicate that capital contributes positively to economic growth in the long run. Other things remain the same, a 1% increase in capital stock leads to about 0.30% increase in real GDP per capita. Furthermore, trade openness is positively related to economic output and this relation is statistically significant at 5% level of significance. Keeping all else the same, a 1% rise in trade openness increases output by 0.15%. This finding validates the trade-led growth hypothesis that is expansion of trade leads to higher level of economic output.

The short-run dynamics results are reported in Table 5. The coefficient on the lagged error correction term is significant with the correct sign, supporting the evidence of a stable long-run relationship among the variables. This coefficient suggests that a deviation from the long run equilibrium level of output in one year is corrected by 70% over the following year. The elasticity of output with respect to capital or trade openness in the short run is positive and statistically significant. In the short-run, capital and trade openness contribute to economic growth.

Table 4. Long run estimates

Regressor	Dependent variable: Log(GDP)					
	ARDL		FMOLS		DOLS	
	Coefficient	*t*-stat.	Coefficient	*t*-stat.	Coefficient	*t*-stat.
Capital (*K*)	0.308*	4.481	0.301*	5.527	0.289*	4.845
Labor (*L*)	−0.190*	−4.990	−0.166*	−5.993	−0.173*	−6.051
Trade (OP)	0.155**	1.775	0.350*	5.670	0.394*	5.728
Constant	10.20*	9.842	7.343*	6.027	7.033*	5.553

*Statistical significance at the 5% levels.

**Statistical significance at the 10% levels.

Table 5. Short run estimation results

Regressor	Dependent variable: ΔLog(GDP)		
	Coefficient	*t*-stat.	Prob.
Δ*K*	1.804*	8.276	0.000
Δ*L*	−1.692	−1.044	0.302
ΔOP	0.117*	3.575	0.000
Constant	7.256*	6.966	0.000
ECM (−1)	−0.706*	−6.820	0.000

*Statistical significance at the 5% level.

The results of this study show that international trade plays a significant role in the economic growth of Cote d'Ivoire, validating the trade-led growth hypothesis both in the short and long run. This finding accords with Asfaw (2014), Zarra-Nezhad et al. (2014), and Brueckner and Lederman (2015), but contradicts with Vlastou (2010), Polat et al. (2015), Ulaşan (2015), Were (2015) and Lawal et al. (2016) who reported a negative or insignificant impact of trade openness on economic growth. Some of these studies do not include into the analysis capital or labor as additional explanatory variables. It is well-known that econometric tests are sensitive to omitted variables and hence studies relying on a bivariate framework may be subject to misspecification bias (Lütkepohl, 1982). On the other hand, differences in economic structure and trade policy may explain why the trade-growth nexus is country-specific. The fact is that Cote d'Ivoire mainly relies on exports of agricultural products such as cocoa, coffee, and cashews that account for 47% of total exports. It also imports raw materials, machines and productive technology that are used as capital for production of goods.

4.3. Granger causality tests and variance decomposition analysis

Before testing for causality, it is necessary to determine the lag length of the level VAR model. The optimal lag length is determined using four statistics: Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), Hannan–Quinn Information Criterion (HQ), and Final Prediction Error (FPE). The optimal lag selected is $p = 5$. As the maximal integrated order of the series is 1, we estimate a level VAR of order $K = 6$ in the Toda-Yamamoto procedure. The results of the Granger-causality tests are presented in Table 6. Clearly, there exists a strong unidirectional causality from capital, labor, and trade openness to GDP. The results also reveal bidirectional causality between trade openness and capital stock, indicating that international trade contributes to increase the capital stock of the economy, which in turn increases output. The finding of economic growth being caused by trade openness supports the trade-led growth hypothesis in the case of Cote d'Ivoire.

The Granger-causality test does not determine the relative strength of causal relations between the variables beyond the selected time period. This weakens the reliability of causality results. To examine the strength of the causal link from one variable to another and to check the relative effectiveness of causality effects ahead of sample period, we apply variance decomposition method. This method explains how much of the predicted error variance for any variable is explained by innovations generated throughout each independent variable over various time horizons. The results displayed in Table 7 show that economic growth is explained predominantly by its own innovative

Table 6. Results of Granger causality tests

Dep. var.	Causal variable			
	GDP	Capital	Labor	Trade
GDP	–	0.006*	0.000*	0.000*
Capital	0.302	–	0.000*	0.035*
Openness	0.250	0.008*	0.246	–

Note: Figures reported are *p*-values of Wald statistics.

*Indicates significance at the 5% level.

Table 7. Variance decomposition

Period	S.E.	GDP	*K*	*L*	OP
Variance decomposition of log(GDP)					
1	0.028270	100.0000	0.000000	0.000000	0.000000
3	0.035729	77.64844	2.724370	0.240319	19.38687
5	0.045975	56.19793	11.25348	2.238418	30.31018
7	0.051533	48.48627	16.01268	6.665601	28.83544
8	0.052068	47.56086	15.68864	6.704608	30.04589
9	0.053037	47.04607	15.12396	8.150519	29.67945
10	0.054101	45.47760	14.65369	11.23233	28.63639
11	0.055241	43.80483	14.19886	14.31596	27.68034
12	0.055395	43.58881	14.13734	14.74695	27.52690
13	0.056310	42.80612	14.29173	15.37085	27.53130
14	0.058534	40.34656	17.44010	16.26982	25.94351
15	0.060548	38.27093	20.58389	16.89917	24.24601
Variance decomposition of log(K)					
1	0.010288	51.34748	48.65252	0.000000	0.000000
3	0.020250	29.75501	61.38695	0.713085	8.144957
5	0.026251	18.23969	43.76284	0.955979	37.04149
7	0.032313	14.16981	33.28088	1.827843	50.72147
8	0.033602	14.34860	33.84939	1.883073	49.91894
9	0.034424	14.09440	35.21607	1.880525	48.80900
10	0.035634	13.45668	37.39790	2.856560	46.28886
11	0.037493	12.80026	39.80089	5.204063	42.19478
12	0.038975	12.48126	41.04775	7.200671	39.27032
13	0.040149	13.05982	42.17079	7.278688	37.49070
14	0.041530	13.96427	43.66750	6.802938	35.56529
15	0.043064	14.74589	45.41643	6.509529	33.32815
Variance decomposition of log(OP)					
1	0.058160	4.414221	1.738856	14.19921	79.64772
3	0.070971	17.87181	1.504599	11.88647	68.73713
5	0.080574	18.50804	4.569071	17.71544	59.20744
7	0.092263	19.16977	14.64157	16.80543	49.38323
8	0.093174	19.13460	15.87941	16.52216	48.46383
9	0.094553	18.91261	17.74884	16.15847	47.18008
10	0.096258	18.27924	19.08557	16.90301	45.73218
11	0.098557	19.54410	20.12771	16.49501	43.83317
12	0.100810	19.28760	21.60437	16.50621	42.60182
13	0.104314	19.81820	23.45972	16.87295	39.84913
14	0.106439	19.72065	24.78345	16.85021	38.64569
15	0.107640	19.28397	24.47340	16.53918	39.70346

shocks (38.2%) while innovative shocks of capital, labor, and trade contribute to GDP by 20.5, 16.9, and 24.2%, respectively. This clearly shows that a 38.2% portion of economic growth is explained by factors outside the empirical model such as financial, political, and institutional factors. Further, the contribution of trade openness is larger as compared to capital and labor. This shows that international trade is a major driver of economic growth in Cote d'Ivoire.

On the other hand, trade openness explains a 33.3% portion of capital stock by its innovative shocks while 45.4% is due to its own shocks and 14.7% by economic growth. This finding implies a causal relationship running from trade to capital formation and is consistent with the Granger causality analysis. The variance decomposition of trade openness reveals that economic growth and capital explain trade growth by 19.3 and 24.5%, respectively. This suggests that both economic growth and capital formation cause trade openness. The causality from economic growth to trade openness was not found in the Granger-causality analysis. Thus, the variance decomposition approach suggests bidirectional causality between trade openness and capital formation, and between economic growth and trade openness. There is a positive complementarity between trade openness and capital formation in promoting economic growth in Cote d'Ivoire.

5. Conclusion and policy implications

The impact of trade openness on economic growth is a subject of debate in the existing literature. The impact was found to be positive in some studies and nonsignificant or even negative in others. The mixed results might be attributed to analytical framework and country specific characteristics. This study examines the impact of trade openness on economic growth in Cote d'Ivoire over the period 1965–2014. The empirical analysis has used a multivariate framework with capital and labor as controlling variables. The ARDL bounds testing approach to cointegration has been applied to test the long-run relationship among the variables. Further, the Toda and Yamamoto Granger-causality approach is used to unravel the direction of causality between trade openness and growth. The results confirm the existence of a long-run relationship between economic growth, capital stock, labor, and trade openness. It was found that capital and openness to trade have positive impacts on economic growth both in the short and long run. Furthermore, we found positive and strong complementarity between trade openness and capital formation in promoting economic growth. Therefore, the results of the study validate the trade-led growth hypothesis in the case of Cote d'Ivoire. This implies that a substantial portion of the economic expansion of Cote d'Ivoire is external. Therefore, Cote d'Ivoire needs to further reduce trade barriers and promote international trade by reducing and simplifying procedures and controls. However, the heavily dependence on international trade may be detrimental to fiscal sustainability and economic growth under the Prebisch–Singer law of decline in the terms of trade. Cote d'Ivoire exports mainly primary products, which prices are unstable and determined on the international market. For outward-oriented strategy to have much larger impact on economic growth, the country should modify the composition of trade by switching from exports of raw materials and semi-manufactured goods to high valued-added goods. Furthermore, trade policy should promote investments in capital intensive sectors and develop human capital that can absorb technologies coming from advanced countries.

Despite the promising results, this study suffers from some limitations. First, the empirical analysis has been conducted using trade at the aggregate level. An area of fruitful future research would be to analyze the trade composition in terms of goods and its impact on economic growth. Such an analysis provides useful information about what underpins the positive impact of trade on economic growth. It will throw light on whether the trade-led growth in Cote d'Ivoire is due to agricultural exports or non-agricultural imports. Second, the estimation method used here may be subject to the problem of potential omitted variable bias and endogeneity of some regressors. Therefore, another useful extension of this research would be to include other relevant variables in a system of equations where trade and capital are also determined by other economic variables. This helps disentangle the channels through which trade affects economic growth.

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Author details
Yaya Keho[1]
E-mail: yayakeho@yahoo.fr
[1] Department of Applied Economics, Ecole Nationale Supérieure de Statistique et d'Economie Appliquée (ENSEA), 08 BP 03 Abidjan 08, Abidjan, Côte d'Ivoire.

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References

Afzal, M., & Hussain, I. (2010). Export-led growth hypothesis: Evidence from Pakistan. *Journal of Quantitative Economics, 8*, 130–147.

Almeida, R., & Fernandes, A. M. (2008). Openness and technological innovations in developing countries: Evidence from Firm-Level Surveys. *The Journal of Development Studies, 44*, 701–727. https://doi.org/10.1080/00220380802009217

Asfaw, H. A. (2014). Trade policy and economic growth in Sub-Saharan Africa: A panel data approach. *American Journal of Trade and Policy, 1*, 94–101.

Bahmani-Oskooee, M., & Niroomand, F. (1999). Openness and economic growth: An empirical investigation. *Applied Economics Letters, 6*, 557–561. https://doi.org/10.1080/135048599352592

Barro, R. J., & Sala-i-Martin, X. (1997). Technological diffusion, convergence, and growth. *Journal of Economic Growth, 2*(1), 1–26. https://doi.org/10.1023/A:1009746629269

Bhagwati, J. N. (1978). *Foreign trade regimes and economic development: Anatomy and consequences of exchange control regime*. Cambridge, MA: Ballinger.

Brueckner, M., & Lederman, D. (2015). Trade openness and economic growth: Panel data evidence from Sub-Saharan Africa. *Economica, 82*, 1302–1323. https://doi.org/10.1111/ecca.12160

Chang, C. P., & ying, Y.-H. (2008). The generative power of air freight in the trade openness-economic growth nexus in african countries. *South African Journal of Economics, 76*, 493–512. https://doi.org/10.1111/saje.2008.76.issue-3

Chang, R., Kaltani, L., & Loayza, N. V. (2009). Openness can be good for growth: The role of policy complementarities. *Journal of Development Economics, 90*, 33–49. https://doi.org/10.1016/j.jdeveco.2008.06.011

Coe, D. T., & Helpman, E. (1995). International R&D spillovers. *European Economic Review, 39*, 859–887. https://doi.org/10.1016/0014-2921(94)00100-E

Cooke, D. (2010). Openness and inflation. *Journal of Money, Credit and Banking, 42*, 267–287. https://doi.org/10.1111/jmcb.2010.42.issue-2-3

Das, A., & Paul, B. P. (2011). Openness and growth in emerging Asian economies: Evidence from GMM estimations of a dynamic panel. *Economics Bulletin, 31*, 2219–2228.

Deme, M. (2002). An examination of the trade-led growth hypothesis in Nigeria: A cointegration, causality, and impulse response analysis. *The Journal of Developing Areas, 36*(1), 1–15.

Dollar, D., & Kraay, A. (2004). Trade. *Growth and Poverty. Economic Journal, 114*, 22–49.

Dufrenot, G., Mignon, V., & Tsangarides, C. (2010). The trade-growth nexus in the developing countries: A quantile regression approach. *Review of World Economics, 146*, 731–761. https://doi.org/10.1007/s10290-010-0067-5

Edwards, S. (1998). Openness, productivity and growth: What do we really know? *The Economic Journal, 108*, 383–398. https://doi.org/10.1111/ecoj.1998.108.issue-447

Fenira, M. (2015). Trade openness and growth in developing countries: An analysis of the relationship after comparing trade indicators. *Asian Economic and Financial Review, 5*, 468–482. https://doi.org/10.18488/journal.aefr

Frankel, J. A., & Romer, D. (1999). Does trade cause growth? *American Economic Review, 89*, 379–399. https://doi.org/10.1257/aer.89.3.379

Freund, C., & Bolaky, B. (2008). Trade, regulations, and income. *Journal of Development Economics, 87*, 309–321. https://doi.org/10.1016/j.jdeveco.2007.11.003

Gries, T., Kraft, M., & Meierrieks, D. (2009). Linkages between financial deepening, trade openness, and economic development: Causality evidence from Sub-Saharan Africa. *World Development, 37*, 1849–1860. https://doi.org/10.1016/j.worlddev.2009.05.008

Grossman, G. M., & Helpman, E. (1990). Comparative advantage and long-run growth. *American Economic Review, 80*, 796–815.

Grossman, G. M., & Helpman, E. (1991a). *Innovation and economic growth in the global economy*. Cambridge, MA: MIT Press.

Grossman, G. M., & Helpman, E. (1991b). Trade, knowledge spillovers, and growth. *European Economic Review, 35*, 517–526. https://doi.org/10.1016/0014-2921(91)90153-A

Haussmann, R., Hwang, J., & Rodrik, D. (2007). What you export matters. *Journal of Economic Growth, 12*, 1–25. https://doi.org/10.1007/s10887-006-9009-4

Huang, L. C., & Chang, S. H. (2014). Revisit the nexus of trade openness and GDP growth: Does the financial system matter? *The Journal of International Trade & Economic Development, 23*, 1038–1058. https://doi.org/10.1080/09638199.2013.830638

Hye, Q. M., Wizarat, S., & Lau, W.-Y. (2016). The impact of trade openness on economic growth in China: An empirical analysis. *The Journal of Asian Finance, Economics and Business, 3*, 27–37. https://doi.org/10.13106/jafeb

Jafari Samimi, A., Ghaderi, S., Hosseinzadeh, R., & Nademi, Y. (2012). Openness and inflation: New empirical panel data evidence. *Economics Letters, 117*, 573–577. https://doi.org/10.1016/j.econlet.2012.07.028

Kali, R., Méndez, F., & Reyes, J. (2007). Trade structure and economic growth. *The Journal of International Trade & Economic Development, 16*, 245–269. https://doi.org/10.1080/09638190701325649

Karras, G. (2003). Trade openness and economic growth: Can we estimate the precise effect? *Applied Econometrics and International Development, 3*, 7–24.

Kim, D.-H. (2011). Trade, growth and income. *The Journal of International Trade and Economic Development, 20*, 677–709.

Kim, D.-H., & Lin, S. (2009). Trade and growth at different stages of economic development. *Journal of Development Studies, 45*, 1211–1224. https://doi.org/10.1080/00220380902862937

Kim, D.-H., Lin, S.-C., & Suen, Y. B. (2011). Nonlinearity between trade openness and economic development. *Review of Development Economics, 15*, 279–292. https://doi.org/10.1111/rode.2011.15.issue-2

Kim, D.-H., Lin, S.-C., & Suen, Y. B. (2012). The simultaneous evolution of economic growth, financial development and trade openness. *The Journal of International Trade & Economic Development, 21*, 513–537. https://doi.org/10.1080/09638199.2010.497933

Klasra, M. A. (2011). Foreign direct investment, trade openness and economic growth in Pakistan and Turkey: An investigation using bounds test. *Quality and Quantity, 45*, 223–231. https://doi.org/10.1007/s11135-009-9272-5

Krueger, A. O. (1978). *Foreign trade regimes and economic development: Liberalization attempts and consequences*. Cambridge, MA: Ballinger.

Kwiatkowski, D., Phillips, P. C. B., Schmidt, P., & Shin, Y. (1992). Testing the null hypothesis of stationarity against the alternative of a unit root. *Journal of Econometrics, 54*, 159–178. https://doi.org/10.1016/0304-4076(92)90104-Y

Lawal, A. I., Nwanji, T. I., Asaleye, A., & Ahmed, V. (2016). Economic growth, financial development and trade openness in Nigeria: An application of the ARDL bound testing approach. *Cogent Economics and Finance, 4*, 1–15.

Lütkepohl, H. (1982). Non-causality due to omitted variables. *Journal of Econometrics, 19*, 367–378. https://doi.org/10.1016/0304-4076(82)90011-2

Marelli, E., & Signorelli, M. (2011). China and India: Openness, trade and effects on economic growth. *The European Journal of Comparative Economics, 8*, 129–154.

Menyah, K., Nazlioglu, S., & Wolde-Rufael, Y. (2014). Financial development, trade openness and economic growth in African countries: New insights from a panel causality approach. *Economic Modelling, 37*, 386–394. https://doi.org/10.1016/j.econmod.2013.11.044

Musila, J. W., & Yiheyis, Z. (2015). The impact of trade openness on growth: The case of Kenya. *Journal of Policy Modeling, 37*, 342–354. https://doi.org/10.1016/j.jpolmod.2014.12.001

Nowbutsing, B. M. (2014). The impact of openness on economic growth: Case of Indian Ocean rim countries. *Journal of Economics and Development Studies, 2*, 407–427.

Pesaran, H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics, 16*, 289–326. https://doi.org/10.1002/(ISSN)1099-1255

Phillips, P. C. B., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika, 75*, 335–346. https://doi.org/10.1093/biomet/75.2.335

Polat, A., Shahbaz, M., Rehman, I. U., & Satti, S. L. (2015). Revisiting linkages between financial development, trade openness and economic growth in South Africa: Fresh evidence from combined cointegration test. *Quality and Quantity, 49*, 785–803. https://doi.org/10.1007/s11135-014-0023-x

Rassekh, F. (2007). Is international trade more beneficial to lower income economies? An empirical inquiry. *Review of Development Economics, 11*, 159–169. https://doi.org/10.1111/rode.2007.11.issue-1

Rigobon, R., & Rodrik, D. (2005). Rule of law, democracy, openness, and income: Estimating the interrelationships. *The Economics of Transition, 13*, 533–564. https://doi.org/10.1111/ecot.2005.13.issue-3

Rivera-Batiz, L. A., & Romer, P. M. (1991). International trade with endogenous technological change. *European Economic Review, 35*, 971–1001. https://doi.org/10.1016/0014-2921(91)90048-N

Romer, P. M. (1990). Endogenous technological change. *Journal of Political Economy, 98*, S71–S102. https://doi.org/10.1086/261725

Romer, P. M. (1994). New goods, old theory, and the welfare costs of trade restrictions. *Journal of Development Economics, 43*, 5–38. https://doi.org/10.1016/0304-3878(94)90021-3

Sakyi, D., Villaverde, J., & Maza, A. (2015). Trade openness, income levels, and economic growth: The case of developing countries, 1970–2009. *The Journal of International Trade & Economic Development, 24*, 860–882. https://doi.org/10.1080/09638199.2014.971422

Shahbaz, M. (2012). Does trade openness affect long-run growth? Cointegration, causality and forecast error variance decomposition tests for Pakistan. *Economic Modelling, 29*, 2325–2339. https://doi.org/10.1016/j.econmod.2012.07.015

Stiglitz, J. E. (1996). Some lessons from the East Asian miracle. *The World Bank Research Observer, 11*, 151–177. https://doi.org/10.1093/wbro/11.2.151

Tekin, R. B. (2012). Development aid, openness to trade and economic growth in least developed countries: Bootstrap panel granger causality analysis. *Procedia-Social and Behavioral Sciences, 62*, 716–721. https://doi.org/10.1016/j.sbspro.2012.09.121

Toda, H. Y., & Yamamoto, T. (1995). Statistical inference in vector autoregressions with possibly integrated processes. *Journal of Econometrics, 66*, 225–250. https://doi.org/10.1016/0304-4076(94)01616-8

Ulaşan, B. (2015). Trade openness and economic growth: Panel evidence. *Applied Economics Letters, 22*, 163–167. https://doi.org/10.1080/13504851.2014.931914

Vamvakidis, A. (2002). How robust is the growth-openness connection: Historical evidence. *Journal of Economic Growth, 7*, 57–80. https://doi.org/10.1023/A:1013418610712

Vlastou, I. (2010). Forcing Africa to open up to trade: Is it worth it? *The Journal of Developing Areas, 44*, 25–39. https://doi.org/10.1353/jda.0.0086

Wang, C., Liu, X., & Wei, Y. (2004). Impact of openness on growth in different country groups. *The World Economy, 27*, 567–585.

Were, M. (2015). Differential effects of trade on economic growth and investment: A cross-country empirical investigation. *Journal of African Trade, 2*, 71–85. https://doi.org/10.1016/j.joat.2015.08.002

World Bank. (1993). *The East Asian miracle: Economic growth and public policy*. New York, NY: Oxford University Press.

Yanikkaya, H. (2003). Trade openness and economic growth: A cross-country empirical investigation. *Journal of Development Economics, 72*, 57–89. https://doi.org/10.1016/S0304-3878(03)00068-3

Young, A. (1991). Learning by doing and the dynamic effects of international trade. *The Quarterly Journal of Economics, 106*, 369–406. https://doi.org/10.2307/2937942

Zarra-Nezhad, M., Hosseinpour, F., & Arman, S. A. (2014). Trade-growth nexus in developing and developed countries: An application of extreme bounds analysis. *Asian Economic and Financial Review, 4*, 915–929.

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