

# THE RELATIONSHIP BETWEEN TRADE OPENNESS AND INDUSTRIALISATION: AN EMPIRICAL ANALYSIS OF A SAMPLE OF 97 COUNTRIES

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## Abstract:

*The objective of this paper is to investigate the nature (causality and form) of the relationship between international trade and industrialisation. To do so, we used the PVAR model of Love and Zucchini (2006) and the dynamic panel threshold regression model of Seo and Shin (2016) on a sample of 97 countries in the world for the period 1996-2019. These economies are subdivided into groups according to their level of income and industrialisation: High-Income Industrial Economies (HIIE), Middle-Income Industrial Economies (MIIE), Middle-Income Industrialising Economies (MIIE) and Low-Income Economies (LIE). Our results show that the causal relationship between international trade and industrialisation is bidirectional for the 97 countries taken together, whereas it is unidirectional for the individual groups. While for the EIRMs, EVIRMs and ERFs industrialisation causes trade openness, trade openness causes industrialisation for the EIRE. The results also show that the level of development conditions the relationship between industrialisation and trade openness for the 97 countries together and for each group of countries. West African countries present specificities in terms of causality.*

**Key words:** Industrialisation, trade openness, causal relationship, threshold effect relationship, level of development.

**JEL classification:** F14; N10; O14; O25

## 1. INTRODUCTION

The relationship between trade openness and industrialisation continues to be debated along three main lines: 1) the nature of the effect (positive or negative) of trade openness on industrialisation, 2) the nature of the causality (unidirectional or bidirectional) between trade openness and industrialisation and 3) the form of the relationship (linear or non-linear) between trade openness and industrialisation if there is causality between these two economic phenomena.

First, if in line with the classics for authors such as Chatri et al. (2019), Dodzin and Vamvakidis (2004), Mignamissi & Nguekeng (2022) trade openness is an important determinant of industrialisation for a country, including developing countries; this is not the case for authors such as Adeleye et al. (2022).

Second, for some authors (Chow ;1987, Adamu and Doğan; 2017, Ali et al.; 2016 and, Mignamissi and Nguekeng; 2022), the causality between international trade and industrialisation can be as much bidirectional, as unidirectional.

Finally, the nature of the link between international trade and industrialisation has received very little attention. However, in the literature, a non-linear relationship between the level of development and industrialisation has very often been established by the work of certain authors such as Clark (1957b) and Mignamissi & Nguekeng (2022).

In addition, the statistics (World Bank, 2020 and UNIDO, 2021) at show major disparities in the relationship between trade openness and industrialisation, depending on the level of development of individual countries. Indeed, analysis of the statistics shows that, for 97 countries in the world grouped into four categories (Table A1 in the appendices) according to their level of development, although all have a degree of openness greater than 55%, these four categories have very different levels of manufacturing value added. While the Low-Income Countries (LICs) with the lowest degree of openness (55.19%) also have the lowest manufacturing value added (9.86), this is not the case

when we compare the situation of the Middle-Income industrialised countries (degree of openness 78.05% and manufacturing value added 18.68) and the situation of the high-income industrialised countries (degree of openness 79.81% and manufacturing value added 15.07). Similarly, while the degree of openness (77.38%) of the middle-income industrialising countries (MICS) is higher than the average degree of openness of all 97 countries (76.29%), the manufacturing value added of the MICS (11.82) is lower than the average manufacturing value added of all countries (14.03).

The size of the sample of countries used in an empirical analysis of the link between international trade and industrialisation through the level of development therefore seems important in order to take into account all possible causalities.

The aim of this paper is twofold. Firstly, to show that there is no single type of causality or direction of causality between international trade and industrialisation. Secondly, to show that the relationship between international trade and industrialisation is not linear, and that the country's level of development is the threshold variable.

To achieve our objective, we conduct a two-stage empirical analysis on heterogeneous panel data. First, a panel VAR model is applied. Then, a threshold effect analysis with a dynamic panel threshold effect model (DPTR) is performed. At each stage, the specific effects of belonging to Africa south of the Sahara, belonging to West Africa, belonging to South Asia and belonging to Latin America are assessed. These analyses are based on a large sample of 97 countries, if not all of them. This paper is organised into six sections. The next section presents a review of the literature on the nature of the link between trade openness and industrialisation. The third section presents the methodological approach adopted to evaluate this link empirically. The fourth section presents and analyses the results of the evaluation of the nature of the causality of the link between trade openness and industrialisation. The fifth section presents and analyses the results relating to the importance of countries' level of development on the linear or non-linear nature of this link. The conclusion and our recommendations are the subject of the sixth section.

## **2. THE NATURE OF THE LINK BETWEEN TRADE OPENNESS AND INDUSTRIALISATION: A REVIEW OF THE LITERATURE**

The terms of the debates on the relationship between trade openness and industrialisation are both theoretical and empirical.

### **2.1 THE BASIS OF THE THEORETICAL DEBATE**

Four main theories emerge from the theoretical literature on the relationship between trade openness and industrialisation: 1) the classical and neoclassical theories, 2) the protectionist theories (theories of infant or nascent industries and ageing industries), 3) the new theories of international trade and 4) the Third Worldist theories.

According to the classical and neoclassical economists of international trade, although not explicitly presented in the reference works (Smith, 1776; Ricardo, 1817; Hecksher, 1919; Ohlin, 1933) trade openness is considered beneficial to industrialisation. For them, countries are characterised by differences in technology and productivity (Smith, 1776; Ricardo, 1817) as well as by differences in the endowment of factors of production (Hecksher, 1919; Ohlin, 1933), which are at the origin of trade between nations. This trade is a source of foreign currency, financing, technology transfer, innovation and diversification of domestic production. All of these factors contribute to the diversification and development of the industrial sector (Caire, 1967). Participation in international trade thus appears to be an essential factor for growth and industrialisation (Krueger, 1980).

For advocates of infant-industry protection (Hamilton, 1791 and List, 1841), while trade openness is important in principle for any country, it is necessary to protect industries in their early stages of development because premature entry into the international market will expose them to competition from more competitive firms in more developed countries. Similarly, it is necessary to protect ageing industries (Kaldor, 1971) because they have been overtaken by technological

innovations and their profits are falling, leading to their closure or to their share of the domestic market being taken over by a foreign company, resulting in unemployment among nationals. In short, according to these theories, opening up trade is not beneficial for a country's industrialisation in all circumstances.

Taking into account the imperfection of competition, Krugman (1979) and Brander and Spencer (1985), among others, argue that the process of industrialisation may not require an absolute opening up of trade, but a strategic one, since the international market is not in a situation of pure and perfect competition, and domestic companies and those in the rest of the world find themselves in strategic interactions.

According to Third Worldists, opening up trade slows down economic growth in developing countries, and therefore their industrial development, because of the deterioration in their terms of trade (Singer, 1950; Prebisch, 1950) and the inequality of international trade (Arghiri, 1969).

## 2.2 THE EMPIRICAL DEBATE

Numerous empirical studies have examined the relationship between trade openness and industrialisation. However, there is no unanimity either in terms of causality or in terms of the form of the link between trade openness and industrialisation.

Tahir et al. (2016) in their study of six member countries (Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka) of the South Asian Association for Regional Cooperation (SAARC) examined the impact of the degree of their trade openness on the development of their industrial sector. Their study, based on a Cobb-Douglas production function and a fixed-effect model, concludes that trade openness favours industrialisation in these countries. As for Chatri et al (2019) examining the link between trade openness and industrialisation for sub-Saharan African countries taken together over the period 1980-2016 using the GMM method in a system, conclude that these countries' foreign trade significantly favours their industrialisation, but not when these countries are grouped according to their income level. In the latter case, they show that trade openness positively affects the industrial development of middle-income countries and oil-exporting countries, while it has no significant impact on the industrial development of low-income countries.

Similarly, Akintude et al (2021) analysed the link between trade openness and industrialisation in 12 West African countries. The study, carried out over the period 1980 to 2019 (39 years), used dynamic ordinary least squares (DOLS) and fully modified least squares (FMOLS) methods. It concludes that the policy of trade liberalisation undertaken in these countries has had beneficial effects on their industrial development.

Effiong et al (2019) studied the nature of the link between globalisation, foreign direct investment and the performance of the industrial sector in Nigeria. Starting from the observation that Nigeria does not seem to have benefited much from globalisation, in particular that trade openness and the current account balance have not had much impact on Nigeria's performance, they applied an error correction model on time series data covering the period 1981 to 2017. They found that FDI has a direct relationship with the Nigerian industrial sector and that globalisation has a positive impact on the performance of the industrial sector.

Khobai and Moyo (2021) studied the effect of trade openness on industrial performance in some Southern Africa Development Community (SADC) countries (South Africa, Eswatini, Mauritius, Tanzania, Malawi, Botswana, Namibia, Mozambique). Starting from the observation that industrial production and employment levels have declined in these countries since the 1990s despite the increase in economic growth, they used the PMG (Pooled Mean Group) method on panel data. They show that trade openness has a significant and positive effect on the industrial sector. In short, the decline in industrial production in the SADC countries can be attributed to changes in the structure of the economies, with the service sectors becoming more dominant.

In the same vein, Eje-Ojeka et al (2023) evaluated the effect of capital inflows and trade openness on industrial production in sub-Saharan African countries. Using the fully modified ordinary least squares (FMOLS) method and principal components analysis (PCA), they conclude

that trade openness and capital inflows improve the efficiency of industrial production in sub-Saharan African countries.

As for Mushtaq et al (2014) studied the impact of trade openness on manufacturing output in five South Asian countries (Bangladesh, India, Pakistan, Nepal and Sri Lanka). Their results, based on a fixed-effects model on panel data covering the period 1986-2011, show that the effect of trade openness on manufacturing output is positive and statistically significant.

In addition, Adofu and Okwanya (2017) seeking to assess the effect of trade openness and total factor productivity on industrial production in Nigeria, show that trade openness has an increasing positive effect on industrial production in Nigeria, while the effect of total factor productivity on industrial production is insignificant. To do this, they used a VAR model and employed the variance decomposition technique on data covering the period 1981-2015.

However, in their study of fifteen countries with a low level of industrialisation over a period of 42 years (1976-2018), Adeleye et al. (2022) and Ojuolape et al (2020) conclude that their opening up to trade has had a negative impact on their industrial output. These authors explain their results by the existence of internal factors (infrastructure deficit, insufficient depth of the financial sector, etc.) which constitute obstacles and inhibit the potential positive effects of trade opening on the industrialisation process of these countries.

Similarly, Akorsu and Okyere (2023) studied the effect of asymmetric trade openness and Foreign Direct Investment (FDI) on industrialisation in Ghana. For these authors, the aim is to explain why Ghana's level of industrialisation is low despite its high degree of openness and the large flow of FDI that the country receives. Using two models (an ARDL model and a NARDL model) and data from the World Bank and UNCTAD, they show that in the short and long term, an increase in the degree of trade openness has no effect on industrialisation in Ghana, while a reduction in the degree of trade openness has a negative effect on Ghana's industrialisation.

Ambiguous relationships are also established in the literature. Cengiz and Manga (2024) sought to determine the dynamic relationship between economic globalisation and deindustrialisation in the countries of the Western Balkans. For these authors, the aim was to understand why deindustrialisation, an expected consequence of globalisation for developed countries given wage differentials and strong internationalisation, is also observed in many developing countries, including those in the Balkans. To do this, they analysed the situation in the countries of the Western Balkans (Albania, Bosnia and Herzegovina, Montenegro, Northern Macedonia and Serbia) using panel data and two models based on the Augmented Mean Group (AMG) estimation method. They established three main results. Firstly, they show the existence of a one-way causal relationship running from economic globalisation and capital investment to the share of industrial employment. Secondly, they show the existence of a causal relationship running from economic growth and the rule of law to manufacturing value added. Finally, they show that there is a causal relationship from manufacturing value added to trade openness and capital investment.

Similarly, Hao (2023) studied the nature of the relationship between trade openness, foreign direct investment, capital formation and industrial growth in China. His starting point is the observation that, although China's foreign trade and FDI flows have led to the rapid development of its industrial economy, the rate of technological progress has been relatively slow compared with that of developed countries, and industrial economic growth has become overly dependent on large inflows of capital, labour and resources, leading to increasingly serious problems of resource scarcity and environmental degradation. Using an ARDL model on data from 1990 to 2021, he establishes that trade openness, FDI and capital all have positive effects on industrial growth and vice versa in the short term. However, contrary to the relationship in the short term, trade openness and capital have a slight negative effect on industrial growth, albeit statistically insignificant. Finally, capital and trade openness have a positive effect on FDI.

Okeke and Ezeala (2024) sought to assess the effect of export trade, import trade and the balance of payments on the real gross domestic product of the Nigerian manufacturing sector. Data from the Central Bank of Nigeria's statistical bulletin from 1999 to 2022 were analysed using the Ordinary Least Squares (OLS) regression method. Their results show that: 1) exports have a positive

and significant effect on the gross domestic product of the Nigerian manufacturing sector, 2) imports have a negative and significant effect on the gross domestic product of the Nigerian manufacturing sector, and 3) the balance of payments has a negative and significant effect on the gross domestic product of the Nigerian manufacturing sector.

Adekunle and Akinwale (2020) analysed the link between trade liberalisation and the manufacturing sector in Nigeria using an ARDL model and Granger causality techniques on data covering the period 1986-2018. They found a dynamic relationship between manufacturing output and trade liberalisation. They also showed that trade liberalisation had a significant indirect impact on manufacturing productivity, while trade liberalisation did not cause manufacturing output in Nigeria.

Finally, since Chow (1987), the nature of the causality between international trade and industrialisation has been the subject of several empirical studies. Their conclusions are ambiguous. Chow (1987) who for the first time empirically tested the causal nature of this link by focusing on the newly industrialised countries, concludes that the causal relationship is bidirectional. While his result was confirmed by the work of Okorie et al (2016) and Ali and Amin (2018) however, Dodzin and Vamvakidis (2004) and Adamu and Doğan (2017) conclude that the causality is unidirectional. Their work, conducted using a Granger causality test, in fact establishes that international trade causes industrialisation and not the other way around.

There is therefore a great deal of ambiguity in the conclusions of empirical analyses on the nature of the causality, the direction and the form of the relationship between international trade and industrialisation, at least at the level of developing countries.

### 3 EMPIRICAL ANALYSIS OF THE NATURE AND CAUSALITY OF THE RELATIONSHIP BETWEEN INTERNATIONAL TRADE AND INDUSTRIALISATION

For the empirical analysis of the relationship between international trade and industrialisation, this section presents our methodological approach for determining the nature of causality and the threshold variable. The reference model is presented first, followed by the empirical models (the Granger causality test and the DPTR model).

#### 3.1 REFERENCE MODEL

Following the example of Chatri et al. (2019) and Tahir et al. (2016) the Cobb-Douglas production function is adopted in this analysis to examine the nature of the relationship between trade openness and industrialisation. This function relates manufacturing output to its various determinants as follows:

$$Y_t = A_t K_t^\alpha L_t^\beta \quad (1).$$

With  $Y_t$  the level of production in the manufacturing industry ;  $K_t$  the capital stock ;  $L_t$  the quantity of labour ;  $A_t$  total factor productivity and  $t$  the time when  $t = 1, \dots, T$ . This function being at constant returns to scale with neutral technical progress in the sense of Hicks; or that the parameters  $\alpha$  et  $\beta$  with values between 0 and 1,  $\alpha + \beta = 1$ .

To carry out this analysis, total factor productivity is disaggregated as follows:

$$A_t = f(C, OUV, DEV, IDE, PVE) = C.OUV^{\beta_1}.DEV^{\beta_2}.IDE^{\beta_3}.PVE^{\beta_4} \quad (2).$$

Equation 1 becomes the following when combined with equation (2):

$$VAM_{it} = C.OUV_{it}^{\beta_1}.DEV_{it}^{\beta_2}.IDE_{it}^{\beta_3}.PVE_{it}^{\beta_4}.FBCF_{it}^{\beta_5}.TRAV_{it}^{\beta_6} \quad (3).$$

With  $VAM_{it}$  manufacturing output;  $OUV_{it}$  the degree of openness to trade;  $DEV_{it}$  the level of development measured by gross domestic product per capita;  $IDE_{it}$  foreign direct investment;  $PVE$  institutional quality measured by political stability and absence of violence,  $FBCF_{it}$  gross fixed capital

formation and  $TRAV_{it}$  labour force,  $i$  the country considered *with*  $i = 1, \dots, N$  and  $t$  the weather with  $t = 1, \dots, T$ .

Empirical specification by linearisation of equation (3) gives the following relationship:

$$\ln VAM_{it} = \ln C + \beta_1 \ln OUV_{it} + \beta_2 \ln DEV_{it} + \beta_3 \ln IDE_{it} + \beta_4 \ln PVE_{it} + \beta_5 \ln FBCF_{it} + \beta_6 \ln TRAV_{it} + \varepsilon_{it} \quad (4).$$

Where  $\varepsilon_{it}$  is the error term.

Our model differs from that of Chatri et al. (2019) and Tahir et al. (2016) by considering manufacturing production rather than industrial production. The reason for this choice is that industrial output includes output from extractive industries, which gives some African countries (such as the Democratic Republic of Congo) a high level of industrial output that does not reflect their processing industry capacity. We believe that manufacturing output is a better indicator of the industrial capacity of African countries, which are renowned for their high natural resource endowment. Our analysis also differs from that of Chatri et al (2019) and Tahir et al (2016) by not taking into account the institutional variable, as this variable is reflected in the level of development. Our work also differs from that of Chatri et al. (2019) in its foundation. Indeed, whereas the objective of Chatri et al. (2019) was to measure the impact of trade openness on industrialisation in line with the principle of a linear relationship, the objective of our paper is to assess the very principle of linearity between trade openness and industrialisation. In our work, we use the model inspired by Chatri et al. (2019) for dynamic panel tests.

### 3.2 PANEL VAR MODEL

VAR modelling allows us to test the potentially multiple nature of the causality between trade openness and the level of industrialisation, taking into account the terms of the theoretical debates. This model is an extension of the traditional panel VAR model of Sims (1980). It is a panel VAR model within the framework of the generalised method of moments (GMM) and was introduced by Love and Zuchino (2006). This model is used in this study because it has several advantages. It treats all the variables in the model as endogenous variables and their lags as independent variables. It uses an automatic lag system to deal with the Granger inverse causality problem and to control simultaneity bias. It also simplifies the choice of instrumental variables by using lagged variables as instruments.

The panel VAR specification used here is based on Abrigo and Love (2016) and Saba and Ngepah (2022). This specification is as follows:  $Y_{it} = Y_{it-1}A_1 + Y_{it-2}A_2 + \dots + Y_{it-p}A_p + \mu_i + e_{it}$ . With  $Y_{it}$  vector ( $1 \times k$ ) of dependent variables;  $\mu_{it}$  and  $e_{it}$ , ( $1 \times k$ ) vectors of fixed effects and idiosyncratic errors specific to the dependent variable,  $i \in \{1, 2, \dots, N\}$  individuals,  $t \in \{1, 2, \dots, T\}$  time. The parameters to be estimated  $A_1, A_2, \dots, A_p$  and  $B$  are matrices of dimension  $(k \times k)$  and  $(l \times k)$  and  $p \in \{1, 2, \dots, k\}$  order of the variables.

Applied to our situation by means of a PVARX model to consider exclusively the causal relationship between industrialisation and international trade, this specification gives the following system of equations:

$$\begin{cases} \ln VAM_{it} = \alpha_0 + \sum_{i=1}^p \rho_{1i} \ln OUV_{it-1} + \sum_{i=1}^p \theta_{1i} \ln VAM_{it-1} + C \ln X_{it} + \mu_{1i} + e_{1it} \\ \ln OUV_{it} = \beta_0 + \sum_{i=1}^p \rho_{2i} \ln OUV_{it-1} + \sum_{i=1}^p \theta_{2i} \ln VAM_{it-1} + D \ln X_{it} + \mu_{2i} + e_{2it} \end{cases} \quad (5).$$

This specification provides the results of panel Granger causality tests which allow us to observe the nature of the causal relationship between trade openness and industrialisation. This causality test is based on the Wald Granger causality test for each equation of the PVAR model when the variables are stationary (Abrigo and Love; 2016).

### 3.3 DYNAMIC THRESHOLD PANEL REGRESSION MODEL

This study uses the panel threshold regression model within the framework of the generalised method of moments (GMM) to examine the relationship between trade openness and industrialisation according to a country's level of development. This model is an extension of the panel threshold regression model of Hansen (1999) developed by Seo and Shin (2016) which allows the threshold variable and the regressors to be jointly endogenous. It also accounts for the endogeneity and simultaneity bias problems inherent in this type of analysis and introduces lagged variables. The main threshold variable is the country's level of development, but we also test for non-linearity when institutional quality, particularly political stability, is considered as a threshold. Its specification is as follows:

$$\ln VAM_{it} = (\beta_1 \ln VAM_{it-1} + \beta_2 \ln OUV_{it} + \beta_3 \ln DEV_{it} + \beta_4 \ln IDE_{it} + \beta_5 \ln PVE_{it} + \beta_6 \ln FBCF_{it} + \beta_7 \ln TRAV_{it}) I_{(\ln DEV_{it} \leq r)} + (\lambda_1 \ln VAM_{it-1} + \lambda_2 \ln OUV_{it} + \lambda_3 \ln DEV_{it} + \lambda_4 \ln IDE_{it} + \lambda_5 \ln PVE_{it} + \lambda_6 \ln FBCF_{it} + \lambda_7 \ln TRAV_{it}) I_{(\ln DEV_{it} > r)} + \varepsilon_{it} \quad |$$

(6).

With  $VAM_{it-1}$  the lagged value of manufacturing value added;  $I_{(\cdot)}$  indicator which takes the value 1 when the condition in brackets is met and 0 otherwise;  $r$  the threshold parameter.

### 3.4 DATA SOURCES AND VARIABLES

This study uses annual data from the World Bank's WDI database and industrialisation data produced by UNIDO and UNSD. The data covers the period 1996-2019. This period was chosen because of the availability of data, and the study covers 97 countries categorised by level of industrialisation according to the UNIDO classification of countries. Economies are classified into four groups according to their stage of industrial development and income level: high-income industrial economies; middle-income industrial economies; middle-income industrialising economies; and low-income economies (see appendices Table A1). Manufacturing value added, trade openness and GDP per capita are the variables of interest in this study.

The introduction of the level of development as an explanatory variable is crucial in this analysis. Indeed, the level of development is an important indicator in the analysis of the industrial development of an economy because it has a non-linear relationship with industrialisation (Clark; 1957b, Mignamissi & Nguekeng; 2022). The level of development could affect the link between trade openness and industrialisation, as postulated by Foster (2006). The level of development is the main threshold variable here. The second threshold variable is institutional quality, measured in particular by political stability. Political stability remains a major concern for most countries, particularly in Sub-Saharan Africa. The variables used in this research are listed in Table 1 below.

**Table 1. Definition of variables**

| Variables                                | Indicators                    | Variable description                      | Source                 |
|--|-------------------------------|---|------------------------|
| <b>Dependent variable</b>                |                               |   |                        |
| <b>VAM</b>                               | Industrialisation             | Manufacturing value added as % of GDP     | UNSD, UNIDO (2021)     |
| <b>Explanatory variables of interest</b> |                               |   |                        |
| <b>OUV</b>                               | Commercial opening            | Total exports and imports as % of GDP     | WDI, World Bank (2020) |
| <b>DEV</b>                               | Level of development          | Gross domestic product per capita         | WDI, World Bank (2020) |
| <b>Explanatory variables</b>             |                               |   |                        |
| <b>GFCF</b>                              | Gross Fixed Capital Formation | Gross fixed capital formation as % of GDP | WDI, World Bank (2020) |
| <b>IDE</b>                               | Foreign direct investment     | FDI inflows in the country as a % of GDP  | WDI, World Bank (2020) |

|             |  |   |                        |
|-------------|--|---|------------------------|
| <b>TRAV</b> | The workforce  | Total activity rate, % of total population aged 15 and over   | WDI, World Bank (2020) |
| <b>PVE</b>  | Institutional variable ( Political stability and absence of violence ) | Value ranging from -2.5 (worst institutional quality) to 2.5 (best institutional quality)                               | WGI, World Bank (2020) |
| <b>ASS</b>  | Specific impact on sub-Saharan African countries                       | Binary variable which takes the value 1 if the country in question is a sub-Saharan African country and 0 otherwise.    | –                      |
| <b>AO</b>   | Specific impact on West African countries                              | Binary variable which takes the value 1 if the country under consideration is a West African country and 0 otherwise.   | –                      |
| <b>AL</b>   | Specific effect on Latin American countries                            | Binary variable which takes the value 1 if the country under consideration is a Latin American country and 0 otherwise. | –                      |
| <b>ASD</b>  | Specific effect for South Asian countries                              | Binary variable which takes the value 1 if the country under consideration is a South Asian country and 0 otherwise.    | –                      |

Source: authors

#### 4 NATURE OF THE CAUSALITY BETWEEN INTERNATIONAL TRADE AND INDUSTRIALISATION

In this section, we first set out the preliminary results, then look for aggregate and specific effects in sub-Saharan Africa and West Africa, and study causality.

##### 4.1 PRELIMINARY TESTS AND CAUSALITY STUDY

For a proper implementation of the PVAR models and the dynamic panel threshold regression model, we perform the cross-sectional data dependence test of Pesaran (2004) and the resulting unit root test. In our analysis, these two types of test aim to take into account two types of potential phenomena that may occur in international relations. The first responds to the possibility of the existence of common factors such as the spatial diffusion of technology, which can correlate the levels of industrialisation of two or more countries or groups of countries, geopolitical or even strategic interactions, which can correlate the levels of foreign direct investment, political stability and absence of violence, etc., of two or more countries or groups of countries (inter-individual dependence test). The second responds to the possibility of a structural break in the temporal evolution of one of our variables, such as the fall of the Berlin Wall in 1989, which led to a profound and structural change in the degree of openness of countries such as the former East Germany (test of the uniqueness of the root).

The test of inter-individual dependence is all the more essential as several countries in different zones grouped by level of industrialisation are analysed in this research and the results recorded in table 2.

**Table 2. Pesaran inter-individual dependency test (2004)**

|                      | CD    | PROBABILITY |
|----------------------|-------|-------------|
| <b>All countries</b> | -2,12 | 0,034**     |
| <b>EIRE</b>          | -2,14 | 0,032**     |
| <b>EIRM</b>          | -3,21 | 0,001***    |
| <b>EVIRM</b>         | -1,76 | 0,078*      |
| <b>ERF</b>           | -2,40 | 0,017**     |

Source: authors based on World Bank (2020) and UNIDO (2021) data

Note: (\*\*\*), (\*\*), (\*) significant at the 1%, 5% and 10% threshold respectively. With the null hypothesis of the presence of inter-individual dependence .

The results show that the p-values of the test are below the 1%, 5% and 10% thresholds, suggesting that there is sufficient evidence to reject the null hypothesis of cross-sectional independence in the groups of countries. Consequently, there is effective dependence between countries. It therefore appears that at least some variables in some countries and/or groups of countries in our sample of 97 countries have dependent values. This is a more realistic assumption in international economic relations.

Given this dependency, the application of a second generation unit root test is relevant in this context. To this end, we use the Pesaran (2007) unit root test, in particular the CIPS test, which is a truncated version of the Im, Pesaran and Shin (2003) test, and the cross-sectional augmented Dickey-Fuller (CADF) test. The results of this second-generation unit root test are presented below.

**Table 3. Results of the unit root test**

| Variables   | In level              |                      | Decision    |
|-------------|-----------------------|----------------------|-------------|
|             | CADF                  | CIPS                 |             |
| <b>VAM</b>  | -6,177***<br>(-2,300) | -6,119***<br>(-2,3)  | <b>I(0)</b> |
| <b>OUV</b>  | -5,925***<br>(-2,300) | -6,164***<br>(-2,3)  | <b>I(0)</b> |
| <b>IDE</b>  | -6,105***<br>(-2,300) | -6,151***<br>(-2,3)  | <b>I(0)</b> |
| <b>GFCF</b> | -5,923***<br>(-2,300) | -5,900***<br>(-2,3)  | <b>I(0)</b> |
| <b>TRAV</b> | -6,179***<br>(-2,300) | -5,460***<br>(-2,3)  | <b>I(0)</b> |
| <b>DEV</b>  | -6,043***<br>(-2,300) | -5,664***<br>(-2,3)  | <b>I(0)</b> |
| <b>PVE</b>  | -2,238***<br>(-2,170) | -2,238 **<br>(-2.16) | <b>I(0)</b> |

Source: authors based on data from the World Bank (2020) and UNIDO (2021); Note: (\*\*\*), (\*\*), (\*) significant at the 1%, 5% and 10% threshold respectively. Trends are included. The Stata command "xtunitroot" is used to calculate the results of the panel unit root tests.

The decision regarding the stationarity of the variable is taken by comparing the test statistic with its critical value. Analysis of the stationarity table shows that all the variables are stationary in level. In short, there is no structural break in the data for any of our variables. This conclusion is not surprising in itself, given that our data covers the period 1996-2019. Over this period, although the degree of openness has probably declined overall following the financial crises, they do not seem to have led to a radical change in the behaviour of countries with regard to the variables used in our model.

## 4.2 AGGREGATE AND SPECIFIC EFFECTS SUB-SAHARAN AFRICA AND WEST AFRICA

This subsection presents the results of the causality test between trade openness and industrialisation. In addition to subdividing economies by stage of development, the study introduces fixed effects for the economies of Sub-Saharan Africa (SSA) and West Africa (WA) in the sample of all countries and in the group of middle-income industrialising countries (MIMICs) to observe whether the nature of the relationship established within these groups of countries changes for SSA and WA. These country-specific effects were not taken into account for the group of low-income countries since most of the countries in this category are SSA countries, nor for the high-income industrial countries and the middle-income industrial countries since these countries contain very few if any SSA countries. This study controls for these effects for SSA and WA economies because there is heterogeneity within economies worldwide but also within developing economies. These effects can only be observed when economies from different economic zones and regions of the world are grouped together. To this end, this research, following Mignamissi and Nguekeng (2022) introduces two additional variables into the analysis of countries as a whole and EVIRMs. These are interaction variables that link trade openness and an indicator variable, thus making it possible to capture the specific effect for SSA and WA countries (OUV\*ASS and OUV\*AO). The panel VAR model was estimated in several stages. The figures showing the results of the stability conditions and the impulse response functions are presented in the appendices (Figure 1). Table 4 presents the results of the Granger panel causality test and the JKS causality test of Juodis et al.(2021). The Granger panel non-causality test of Juodis and al (2021) is used here as a comparative model to examine the causal relationship between trade openness and industrialisation. Note that Table 4 presents the conclusions of the causality test for only the key variables of the study (manufacturing value added, trade openness).

The results point to three main findings, showing a variable overall situation in terms of causality, since this appears to be bidirectional, unidirectional from trade opening to industrialisation, or vice versa.

Firstly, the causality between trade openness and industrialisation is bidirectional for: 1) all countries, 2) all middle-income industrial economies and 3) all low-income economies if the estimates are based on the JKS model. The null hypotheses that trade does not cause industrialisation and that industrialisation does not cause trade are rejected at the 5% threshold for all countries with p\_values of 0.001 and 0.017 respectively. This reciprocal relationship implies that trade openness leads to industrialisation, and industrialisation is just as crucial to trade openness. This result can be explained by the fact that, initially, participation in international trade provides the essential elements for the industrial development of economies through the usual channels. But as the industrial sector develops, countries gain in importance on the world market. This can be seen in the significant participation of industrialised countries in global value chains and world trade (Mignamissi and Nguekeng; 2022). The reason for this may be to be found in the nature of the segments of value chains in which the level of industrialisation makes it possible to enter. When a country has a low level of industrialisation, its export offerings have a low added value relative to those of more industrialised countries.

**Table 4. Results of the Wald test and the chi-square value of the Granger causality of the panel VAR model**

| Country categories | Models         | P-value        | Direction     | Nature         |
|--------------------|----------------|----------------|---------------|----------------|
| All countries      | JKS            | 0,001***       | Ouv → Vam     | Bidirectional  |
|                    |                | 0,017**        | Vam → Ouv     |                |
|                    | Var in panel   | 0,011**        | Ouv → Vam     | Bidirectional  |
|                    |                | 0,000***       | Vam → Ouv     |                |
|                    |                | 0,277          | Ouv*ASS↔ Vam  | Unidirectional |
|                    |                | 0,023**        | Vam → Ouv*ASS |                |
|                    |                | 0,840          | Ouv*AO ↔ Vam  | -              |
|                    |                | 0,658          | Vam↔ Ouv*AO   |                |
|                    |                | 0,060*         | Ouv* AL→Vam   | Bidirectional  |
|                    |                | 0,000***       | Vam → Ouv* AL |                |
| 0,050**            | Ouv* ASD→ Vam  | Unidirectional |               |                |
| 0,940              | Vam ↔ Ouv* ASD |                |               |                |
| EIRE               | JKS            | 0,010***       | Ouv → Vam     | Unidirectional |
|                    |                | 0,427          | Vam ↔ Ouv     |                |
|                    | Var panel      | 0,069*         | Ouv → Vam     |                |
| EIRM               | JKS            | 0,000***       | Ouv → Vam     | Bidirectional  |
|                    |                | 0,000***       | Vam → Ouv     |                |
|                    | Var in panel   | 0,673          | Ouv ↔ Vam     | -              |
|                    |                | 0,722          | Vam ↔ Ouv     |                |
| EVIRM              | JKS            | 0,015**        | Ouv → Vam     | Unidirectional |
|                    |                | 0,115          | Vam ↔ Ouv     |                |
|                    |                | 0,224          | Ouv ↔ Vam     |                |
|                    | Var panel      | 0,478          | Vam ↔ Ouv     | -              |
|                    |                | 0,736          | Ouv*ASS ↔ Vam |                |
|                    |                | 0,098*         | Vam → Ouv*ASS | Unidirectional |
|                    |                | 0,729          | Ouv* AO ↔ Vam |                |
|                    |                | 0,868          | Vam → Ouv* AO | -              |
|                    |                | 0,004***       | Ouv* AL → Vam |                |
|                    |                | 0,026**        | Vam → Ouv* AL |                |
| 0,263              | Ouv* ASD ↔ Vam | Unidirectional |               |                |
| 0,073*             | Vam → Ouv* ASD |                |               |                |
| ERF                | JKS            | 0,000***       | Ouv → Vam     | Bidirectional  |
|                    |                | 0,072*         | Vam → Ouv     |                |
|                    | Var in panel   | 0,252          | Ouv ↔ Vam     | Unidirectional |
|                    |                | 0,003***       | Vam → Ouv     |                |

Source: authors based on World Bank (2020) and UNIDO (2021) data.

Note: (\*\*\*), (\*\*), (\*) significance at the 1%, 5% and 10% threshold respectively. The symbols ↔ and → /←; signify bidirectional or unidirectional causality respectively. Whereas the symbol ↔ represents the hypothesis  $H_0$  : the excluded variable does not cause according to Granger the variable in the equation with the alternative hypothesis  $H_1$  : the excluded variable causes according to Granger the variable in the equation.

Secondly, the unidirectional causality from openness to industrial performance for EIRE (JKS models and VAR panel model) and EVIRM (JKS model) is consistent with the predictions of classical and neoclassical theories. This result confirms that of Chatri et al (2019) who found a unidirectional causal relationship in which participation in international trade causes the industrial performance of the countries considered. Similarly, it is consistent with the results of Dodzin and Vamvakidis (2004) and Tahir et al (2016) for which participation in international trade explains the performance of domestic industries in the countries considered. In sum, for EIREs and EVIRMs, access to a global market (participation in international trade) is a factor favouring industrial performance for EIREs and industrialisation for EVIRMs.

Finally, for the 97 countries taken together, for the EREs, for the SSA countries taken together and for the AO countries, the causality is certainly unidirectional as before, but it is industrial performance (or the level of industrialisation) that causes trade openness. In short, these countries need to improve their industrial performance (or industrialise) in order to participate more effectively in international trade. This seems to be borne out by the low weight of the least developed countries and African countries in world trade. Indeed, SSA accounts for less than 3% of world trade, a situation that can be explained by their low level of industrialisation. SSA and WA countries specialise in exporting primary products, which provides low incomes for these countries, which have a low level of industrialisation. (Boly; 2012, Correa & Kanatsouli; 2018).

In short, the one-way causality from trade opening to industrialisation of classical and neoclassical theories is called into question, because not only can causality run from industrialisation to trade opening, but it can also be bidirectional.

## **5 SHAPE OF THE RELATIONSHIP BETWEEN INTERNATIONAL TRADE AND INDUSTRIALISATION BY DPTR**

For the estimation of the DPTR dynamic panel threshold regression model of Seo and Shin (2016), we cluster groups of countries with close levels of industrial development including countries with high levels of industrialisation (EIRE and EIRM) and countries in the process of industrialisation and with low levels of industrialisation (EVIRM and ERF). We also group the series by two years to reduce the temporal dimension of the sample, as required by the model.

The results of the dynamic panel threshold regression (DPTR) model of Seo and Shin (2016) are presented in Table 5 below. This model was estimated in order to detect the existence or not of a non-linear relationship between trade openness and industrialisation, and to identify the variables that condition this relationship.

This table presents the results of the analysis of the non-linear relationship between international trade and industrialisation, when the level of development and institutional quality (Chatri et al, 2019; Mignamissi and Nguekeng, 2022) are considered as transition variables. This approach is applied to observe whether these variables condition the relationship between trade openness and industrialisation in the different groups of countries. The results show that the null hypothesis of linearity of the relationship between trade openness and industrialisation in relation to the threshold variables level of development and institutional quality (political stability) is rejected at the 5% level. However, given the significance of the different thresholds, the threshold variable of interest in the analysis is the country's level of development.

The results show that the level of development conditions the relationship between industrialisation and international trade in the sample as a whole and in all the other groups of countries. On the other hand, the quality of institutions only conditions this relationship in all countries and in industrialised countries. These results confirm the hypotheses of this study concerning the relationship between trade openness and industrialisation and contradict most studies that analyse this relationship from a linear perspective (Chatri et al., 2019; Dodzin & Vamvakidis, 1999, 2004; Dutta & Ahmed, 2004; Sade et al., 2021; Tahir et al., 2016).. This result reflects that the effects of participation in international trade are differentiated according to the presence of certain

preconditions to facilitate industrial development, which confirms Rodrik's (2002) analysis that trade openness is not a panacea.

When the level of development is considered as the threshold variable of the study, we find that delayed industrialisation has a positive and significant effect at the 1% threshold on industrialisation in all countries. Thus, a 1% increase in industrialisation the previous year leads to a 51.9% increase the following year below the threshold of 7.660. When the level of industrialisation has increased by 1% the previous year, the countries record an increase. This is also the case for the industrialised countries and those in the process of industrialisation in the lower regime, with increases of 51.3% and 86.6% respectively. However, beyond the threshold, this effect becomes negative for both industrialised and industrialising countries, with a fall of -58.7% in the industrialised countries.

Analysis of the results reveals that the threshold value for the level of development obtained in industrialised countries, estimated at 10.395, surpasses that for all countries, which is 7.660. However, the threshold value for industrialising countries, estimated at 7.003, is lower than that for all countries. This result exposes the differences in the level of industrialisation in the different groups of countries.

Trade openness has a positive and significant effect on industrialisation only in all the countries in the lowest regime. Thus, when the degree of trade openness increases by 1% in this regime, the level of manufacturing value added increases by 22.8%. However, above the threshold (7.660). However, in industrialised and industrialising countries the effect of participation in international trade on industrialisation is negative. Thus, trade openness leads to a fall in the level of industrialisation of 11.9% in industrialised countries. We note that the transition from the lower to the higher regime leads to a change in the sign of the coefficients in all groups of countries. In fact, in the higher regime for all countries, trade openness leads to a significant fall in the level of industrialisation of 22.2%; whereas in the industrialised countries trade openness leads to a significant rise of 60% in the level of industrialisation. This indicates that the change in the level of development of economies affects the nature of the link between international trade and industrialisation.

The specific tests carried out in all the countries for the SSA and WA economies indicate that trade openness has a negative and significant effect on industrial development below the threshold. Thus, when the degree of trade openness increases by 1%, the level of industrial development in these countries falls by -0.1% and -0.7% respectively. Above the threshold, the effect of trade openness on industrialisation becomes significantly positive in WA countries, leading to a 0.3% rise in the level of industrialisation. On the other hand, the negative effect in the SSA countries remains unchanged, even if the magnitude decreases (-0.03%). The negative effect is observed in both regimes, but is more pronounced in the lower regime in SSA countries. These economies therefore need to create the necessary conditions and reach a certain level of development in order to benefit from the advantages of international trade for industrial development and participate effectively in international trade. This result is consistent with that obtained by Adeleye et al (2022) and Ojuolape and Adeniyi (2020) who find that trade openness is a brake on industrial development in countries lagging behind in industrialisation. This result can be explained on two main levels. Firstly, it can be explained by the fact that SSA countries in general, and those of Western Africa in particular, mainly export low value-added products (unprocessed primary products) and import high value-added products (industrial products). It is also explained by the effect of the high level of corruption in these countries, which leads not only to a weak effect of trade gains in these countries but also to an unequal distribution of these gains, thus causing a weak (or even non-existent) knock-on effect as predicted by the theory.

**Table 5. Results of the estimation of the dynamic panel threshold regression model of the OUV and VAM link**

| Country groups →                                    |                                      | All countries         |                       | Industrialised countries |                      | Industrialising countries |                     |
|---|--------------------------------------|-----------------------|-----------------------|--------------------------|----------------------|---------------------------|---------------------|
| Dependent variable →                                |                                      | VAM                   |                       |                          |                      |                           |                     |
| Explanatory variables ↓                             | Threshold variables → Coefficients ↓ | DEV                   | PVE                   | DEV                      | PVE                  | DEV                       | PVE                 |
|   |                                      | VAM <sub>t-1</sub>    | $qit\ r \leq$         | 0,519***<br>(0,019)      | 0,756***<br>(0,016)  | 0,513***<br>(0,104)       | 0,547***<br>(0,103) |
|   | $qit\ r > r$                         | 0,097***<br>(0,020)   | 0,028*<br>(0,015)     | -0,587**<br>(0,269)      | -0,753***<br>(0,160) | -0,531<br>(0,326)         | 0,361***<br>(0,140) |
| OUV   | $qit\ r \leq$                        | 0,228***<br>(0,020)   | 0,013<br>(0,015)      | -0,119***<br>(0,040)     | -0,0008<br>(0,020)   | -0,108<br>(0,173)         | 0,056<br>(0,083)    |
|   | $qit\ r > r$                         | -0,222***<br>(0,019)  | -0,091***<br>(0,022)  | 0,600***<br>(0,157)      | -0,128**<br>(0,059)  | 0,182<br>(0,238)          | -0,334*<br>(0,183)  |
| GFCF  | $qit\ r \leq$                        | 0,023***<br>(0,008)   | 0,176***<br>(0,011)   | 0,085***<br>(0,021)      | 0,188***<br>(0,035)  | 0,036<br>(0,067)          | -0,034<br>(0,053)   |
|   | $qit\ r > r$                         | -0,059***<br>(0,015)  | -0,199***<br>(0,019)  | 0,214<br>(0,140)         | -0,213***<br>(0,060) | -0,039<br>(0,200)         | -0,085<br>(0,205)   |
| IDE   | $qit\ r \leq$                        | 0,019***<br>(0,002)   | 0,007***<br>(0,002)   | -1,357***<br>(0,389)     | 0,001<br>(0,004)     | 0,004<br>(0,014)          | 0,012***<br>(0,004) |
|   | $qit\ r > r$                         | -0,016***<br>(0,003)  | 0,001<br>(0,003)      | -3,390***<br>(0,627)     | -0,005<br>(0,009)    | 0,0002<br>(0,019)         | -0,017<br>(0,010)   |
| TRAV  | $qit\ r \leq$                        | -0,583***<br>(0,086)  | -0,431***<br>(0,122)  | -0,006**<br>(0,003)      | -0,629**<br>(0,253)  | -1,031<br>(0,971)         | -1,590**<br>(0,644) |
|   | $qit\ r > r$                         | 0,052<br>(0,059)      | 0,091<br>(0,061)      | 0,009**<br>(0,005)       | -1,634<br>(0,413)    | -0,092<br>(0,843)         | 0,541***<br>(0,203) |
| OUV_ASS   | $qit\ r \leq$                        | -0,001***<br>(0,0002) | 0,0005**<br>(0,0002)  | –                        | –                    |                           |                     |
|   | $qit\ r > r$                         | -0,0003<br>(0,0002)   | 0,0006***<br>(0,0002) | –                        | –                    |                           |                     |
| OUV_AO  | $qit\ r \leq$                        | -0,007***<br>(0,0003) | -0,0005<br>(0,0003)   | –                        | –                    |                           |                     |
|   | $qit\ r > r$                         | 0,003***<br>(0,0004)  | -0,001***<br>(0,0001) | –                        | –                    |                           |                     |
| <b>Threshold value ( ) <math>\mathcal{I}</math></b> |                                      | 7,660***              | -0,296***             | 10,395***                | 0,773***             | 7,003***                  | 0,197               |
| <b>Linearity test (P-value)</b>                     |                                      | 0,000                 | 0,000                 | 0,000                    | 0,000                | 0,000                     | 0,201               |

**Source:** Author based on World Bank and UNIDO databases (2020). With  $\mathcal{I}$  : the value of the threshold;  $qit$ : represents the threshold variable (DEV or PVE)

**Note:** (\*\*\*), (\*\*), (\*) significance at the 1%, 5% and 10% threshold respectively. The estimation results are obtained using the "xthenreg" command in Stata

## 6. CONCLUSION AND POLICY RECOMMENDATIONS

This paper empirically analyses the relationship between industrialisation and trade openness in a panel of 97 countries over the period 1996-2019. The countries have been subdivided into four groups according to their level of development and industrialisation: high-income industrial economies (HIEs), middle-income industrial economies (MIIEs), middle-income industrialising economies (MIIEs) and low-income economies (LIEs) on the basis of the UNIDO classification.

Our objective was to analyse the nature of the causality between trade openness and industrialisation on the one hand, and to analyse the form of the link between trade openness and industrialisation on the other. The reason being that the nature of the causality and the form of the relationship between trade openness and industrialisation remain debated.

To conduct our analysis, on the one hand the panel VAR technique based on the GMM model of Love and Zucchini (2006) and Abrigo and Love (2016) was applied; this controlled for endogeneity, cross-sectional dependence and unobserved heterogeneity within the data. On the other hand, the dynamic panel threshold regression (DPTR) model of Seo Shin (2016) and Seo et al (2019) was used to better identify the nature of the relationship between variables including trade openness and the level of industrialisation.

The results show that the causal relationship can be just as bidirectional as unidirectional, depending on the group of countries considered and the causality test used to conduct the analysis. In other words, if trade openness can cause industrial development or performance, then industrialisation can also cause trade openness, not forgetting that both can feed into each other. Taking into account the specific effects in all the countries suggests that it is industrialisation that could promote the active participation of the countries of sub-Saharan Africa and West Africa in the international trade market. The results of the estimation of the DPTR model show that not only is the level of development essential to the nature of their interaction, but also that the relationship between trade openness and industrialisation is not linear.

In short, our results show that not only is causality not a one-way street in the relationship between international trade and industrialisation, but also that its direction changes mainly with the level of development of the countries under consideration.

### **Implications for economic policy**

Trade openness is not a panacea for boosting a country's development or industrial performance; this is only true for EIREs and EVIRMs. According to the results of this study, the trade and economic policies to be recommended to a country depend on its level of development when it comes to exploiting the knock-on mechanisms of trade openness.

With specific regard to the countries of sub-Saharan Africa and West Africa, any policy that promotes their industrial development first and foremost would be a good thing, as it would enable them to better integrate into international trade.

In fact, our results suggest that countries lagging behind in industrialisation should implement economic protectionism measures to protect their fragile industries from foreign competition until they resolve the internal constraints that are hampering their industrial development through industrialisation strategies adapted to their context. Since economic development is an initial condition for any trade-led industrialisation strategy.

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## Appendices

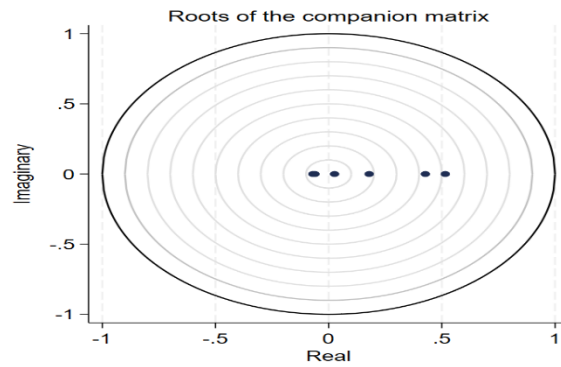
**Table A1. UNIDO classification of countries by stage of industrial development**

| <b>EIRE</b>       | <b>EIRM</b>  | <b>EVIRM</b>       | <b>ERF</b>   |
|-------------------|--------------|--------------------|--------------|
| Germany           | South Africa | Albania            | Burkina Faso |
| Australia         | Argentina    | Azerbaijan         | Burundi      |
| Austria           | Belarus      | Benin              | Gambia       |
| Saudi Arabia      | Brazil       | Bolivia            | Madagascar   |
| Belgium           | Bulgaria     | Botswana           | Mali         |
| Brunei Darussalam | China        | Cameroon           | Mozambique   |
| Chile             | Colombia     | Comoros            | Niger        |
| Cyprus            | Costa-Rica   | Ivory Coast        | Rwanda       |
| South Korea       | Egypt        | Gabon              | Chad         |
| Denmark           | El Salvador  | Ghana              | Togo         |
| Spain             | Ecuador      | Guatemala          |              |
| United States     | Eswatini     | Honduras           |              |
| Finland           | Indonesia    | India              |              |
| France            | Jordan       | Jamaica            |              |
| Greece            | Malaysia     | Kazakhstan         |              |
| Hungary           | Maurice      | Kenya              |              |
| Iceland           | Panama       | Kyrgyzstan         |              |
| Israel            | Paraguay     | Northern Macedonia |              |
| Italy             | Philippines  | Morocco            |              |
| Japan             | Romania      | Moldova            |              |
| Latvia            | Russia       | Mongolia           |              |
| Lithuania         | Sri-Lanka    | Namibia            |              |
| New Zealand       | Thailand     | Nepal              |              |
| Norway            | Turkey       | Nigeria            |              |
| Oman              |              | Pakistan           |              |
| Netherlands       |              | Senegal            |              |
| Poland            |              | Tunisia            |              |
| Portugal          |              | Ukraine            |              |
| Czech Republic    |              | Vietnam            |              |
| United Kingdom    |              |                    |              |
| Sweden            |              |                    |              |
| Switzerland       |              |                    |              |
| Uruguay           |              |                    |              |

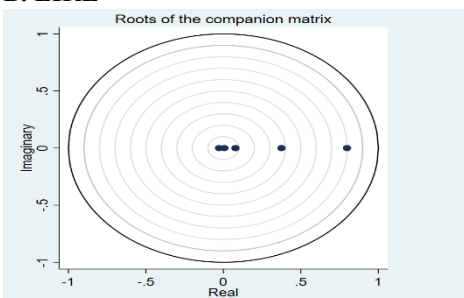
Note: **EIRE**: High Income Industrialised Economies ; **EIRM**: Middle Income Industrialised Economies ; **EVIRM**: Middle Income Industrialising Economies ; **ERF**: Low Income Economies.

**Figure 1. Results of stability conditions for all countries and different groups of countries**

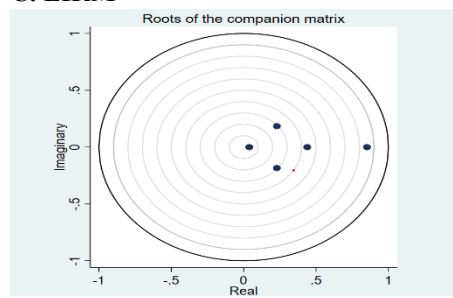
**A. All countries**



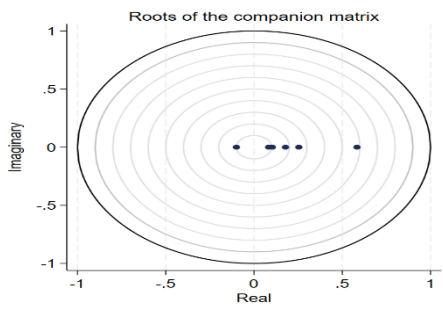
**B. EIRE**



**C. EIRM**



**D. EVIRM**



**D. ERF**

