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The Contribution of FDI Inflows on High Technological Structure of Rwanda Manufactured Exports

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***Abstract*— The contribution of Foreign Direct Investment inflows on High Technological Structure of Rwanda Manufactured Exports for the period 1987-2017. We used a Vector Autoregressive model, to analyze this relationship: determined the lag structure verified the stationarity of both series and explored co-integration and causality between High-technology manufactured exports, total exports value and Foreign Direct Investment inflows. Our findings established that a VAR (1) was the appropriate model and found that all variables have long-term or long-run equilibrium in Rwanda as confirmed by Tests of co-integration. Granger tests have suggested that technological structure of manufacturing and Foreign Direct Investment inflows are independent (no causality between them) for the Rwandan economy while Foreign Direct Investment inflows have a great contribution on Rwanda manufactured exports. The study also suggests that the policy regarding domestic efforts to enhance manufacturing exports needs reassessment in line with the FDI policy framework in order to reap maximum and long-term equilibrium.**

***Index Terms*— FDI inflows, High Technological Manufacturing, Manufactured Exports and Technological Structure.**

I. Introduction

Technology structure of manufactured exports has played a considerable role in economic growth and trade sector. Among these channels, FDI inflows have considered as great significance in these domains (Kevin, 2005). Also, different researchers present reasons and arguments that FDI inflows provide developing countries with the boost capital formation, transfer new technology knowledge, increase employment, enhance business competitions, encourage technological and management spill-over increased as result of high exports for the host country (Hoekman, 2006; Moran, 2011).

In addition, Rwanda has known that inwards FDI plays a great contribution on investment capital continuously as demonstrated by analysis of Economic Snapshot (2017) data, FDI was less than 5% of gross fixed capital formation in 2005, while from 2005 up to 2015, it had increased up to 10%, this increment brings Rwanda to higher place than other countries in EAC (East Africa Community). As result, this increment caused a great contribution of FDI on Rwandan GDP (Gross Domestic Products), where the country economy has been promoted better than the average in sub-Saharan Africa and similar to the average for globally of low-income countries.

For increasing technological structure of manufacturing exports, Rwanda has built its growth economies on FDI flows, as a result of FDI inflows in developing countries increasingly flows to medium and high-skilled manufacturing sectors, involved in a kind of operation in socially and environmentally responsible manner and value-adding jobs are created to host country and even more are required to relieve the pressure on rural land (Moran et al., 2016). Thus expanding exports has become critical for macroeconomic stability as well as job creation. Joshua (2008) argue that FDI inflows considered as international business important sectors, where it promotes manufacturing exports of the host countries by increasing inwards capital for exports, giving indirect or direct assistance to transfer technology and new products for exports, making easier access to new and large externals markets, giving direct and indirect training to the local workforce, and raising technical and management skills.

The aforementioned information triggers the curiosity to study if there is the great contribution of FDI inflows on the high technological structure of Rwanda manufactured exports. The contribution of FDI inflows on manufactured exports in host country particularly in developing countries is a hot topic in the international business area, in this paper; we analyze the better way to use FDI inflows in Rwanda and optimizing its high technological structure of manufactured exports. This research also responded to the following questions: (1) Is there any contribution of FDI inflows on high technological manufactured exports of Rwanda? And (2) Do FDI inflows bring improvement on the high technological structure of Rwanda manufactured exports?

II. LITERATURE REVIEW

A. Theoretical models on FDI inflows and technology spillovers

There are many researchers who analyze the consequence of FDI on recipient countries' economies. Trade theories try to explain why countries trade with one another while FDI theories try to explain why firms produce and invest abroad in particular countries, on top of that, there are mainly two aspects of possible linkages between FDI and trade: (a) whether FDI is a substitute for trade or a complement to trade; and (b) whether FDI causes positively improvement in trade or vice versa (Imad, 2002). Among the different ways of modelling international technology

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diffusion, technology transfer via foreign direct investment inflows is an important research agenda. The literature on the role of FDI inflows in technology transfer and its effects on the manufactured exports of host countries focus on two distinct processes in international technology transfer. The first one is technological structure transfer from the parent firm of a multinational company to its subsidiary abroad. The second is technological structure transfer in the form of an externality from the subsidiary to domestic firms (Wang, 1992).

De Mello (1997) provides a model in which the existence of foreign direct investment inflows creates externalities in the stock of technology of the host country. The stock of technology (H) is accepted as a function of foreign-owned and domestic-owned physical capital stock.

$$H = [k_d k_w^{\alpha}]^{\mu} \quad (1)$$

Where α and μ are the marginal and the intertemporal elasticities of substitution between foreign and domestic owned capital stocks. A general growth accounting equation in this model is defined as follows:

$$g_y = g_A + [\beta + \mu(1-\beta)]g_d + [\alpha\mu(1-\beta)]g_w \quad (2)$$

By equation (2), De Mello argues that the effect of FDI inflows on the growth performance of the host country is manifold. In his model, FDI inflows are found to be a growth-determining factor where a higher growth rate of the economy is the causal connection with a great intensity level of FDI inflows. In the models of De Mello (1997), the advanced technology introduced by foreign firms is considered under the assumptions that it naturally is a public good and transferred automatically. However, as argued by Fan (2002), "the growing importance of international patent agreements and the licensing of technology suggest that technological knowledge is frequently a private rather than a public good, and that technology can rarely be automatically transferred". As a result, this model does not raise or deal adequately with the issue of interaction between foreign subsidiaries of multinational firms and host country firms.

More recently, Borensztein, (1998) propose a model to address the question of how foreign direct investment affects the economic growth of developing countries through technology diffusion. Their model is having a base on the content of cognition the economic growth rates of developing countries are partly explained by a "catch- up" process in the level of technology. In particular, the extent of adoption and implementation of new technology that is already in use in leading countries will determine the economic growth rate of the developing country. In their model, technological progress takes the form of new types of intermediate manufacturing products introduced by foreign firms and available in the developing country. The existence of FDI inflows lowers the cost of introducing new technological structure and thus raises the rate of technological manufacturing changes and manufactured exports in the developing country (Hatzichronoglou, 1997).

B. Relationship between FDI inflows and technological structure of exports

"Technological structure of exports" is used to represent the manufacturing level in certain industries that represent developed technologies, products or services that are advanced. These industries are commonly recognized with R&D and technological expertness and are generally composed of high income and advanced scientific research (jobs creation) (Seyoum, (2004). This expands benefit in open economy technological structure is high due to the concept that an economy of international business of technological structure manufacturing products communicates about competitiveness and its location in the global technology market. This benefit also provides to how innovation in an active economic environment pretends its relative advantages and the relative importance of high technology to open economy markets (Tebaldi, 2011).

Foreign Direct Investment inflows and the international business are providing a compliment and reciprocally accessory, although growingly indivisible as different positions of the process of international business (Jayakumar et al, 2014). As well as, Foreign Direct Investment inflows accelerate exports from inwards sectors direct productions firms (Harrison et al., 1993). This consequence produces a high demand input for domestic firms and promotes exports. Inward Foreign Direct Investment is anticipated to pretend exports from the exports distribute position of the home country. Foreign Direct Investment Inflows may increase export-tailored productivity that boosts export dramatic. Others may indicate that exports extend to rise in productivity that promotes foreign investors to attempt Foreign Direct Investment inflows.

Also, export leads to development by alleviating labour militarization and capital collection. In hypothesis, there is a bipartisan causative relationship among open economy and productivity though encourages of export-contributed growth, in general, argue that exports heighten productivity development. These economists indicate that industries have a tendency to acquire boosted technologies through exports and must follow them to compete in the foreign market direct (Jayakumar et al., 2014).

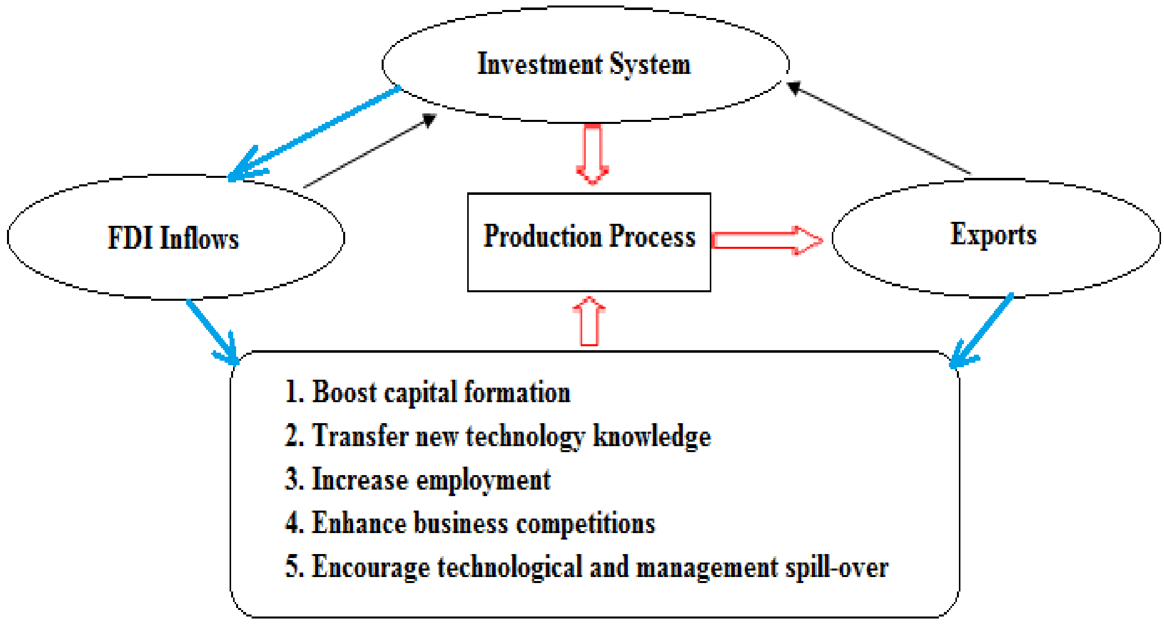

Figure1: Possible links on Investment, FDI inflows, and Exports
Source: Auther's design

Rashmita (2013) analyzed a study on the impact of FDI inflows on exports and growth of an economy agreed that FDI Inflows and exports are co-integrated and advise a unidirectional causing from FDI Inflows to export development. This involves FDI Inflows drives export development in the long-run, however, does not determine in the short-run. This is because many developing countries see FDI Inflows as a significant component of their strategies for economic growth.

C. FDI inflows trends in Rwanda

As other developing countries of the world, Rwanda confronts especial challenges in Foreign Direct Development of leverage for growth as an effect of its economic structure, the low degree of human capital growth, its landlocked attitude and its small size. It endured enormous adversity as an effect of the racial extermination in 1994, as well as to the human being repulsion, conducted to the break of the economy and left much of the infrastructure bedraggled (UNITED NATIONS, 2006). Also, Sung et al. quoted by Bruno et al. (2013), analyzed determinants of FDI inflows in Rwanda and argue that the Economic development and trade openness have a substantial convinced effect on inwards Foreign Direct Investment in Rwanda. On the other hand, Rusuhuzwa et al. quoted by Bruno et al. (2013), analyzed the impact of FDI on economic development in Rwanda and Burundi argue that the impact of FDI to economic development is not substantial.

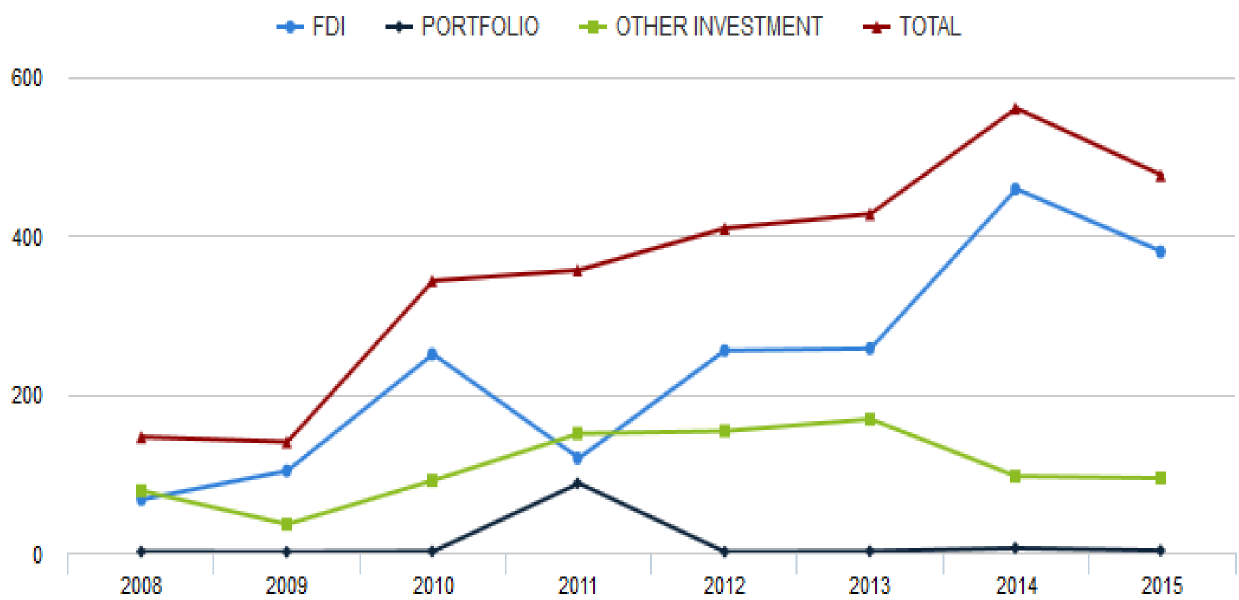

Figure 2: Contribution of foreign private investment inflows in Rwanda 2008-2015 (US$ million)
Source: National Institute of Statistics of Rwanda, (2017)

However, Prasanna, (2010) argue that there is the positive contribution of FDI inflows on manufacturing export performance as it opines that capital and consumption goods not available locally are imported, and profits remitted, thus cutting into the export earnings generated. However, the FDI inflows role tended to be larger when local capabilities were weak. Similarly, in Latin America FDI inflows' role was high in low – quality segments where wage costs are the main competitive factor; there is little design capability or independent marketing (World Bank, 2015).

Technological structure of manufacturing exports of Rwanda are summarised by the following four categories:

Resources based manufactures and Primary products (Agro/forest-based products and Other resources based products)**;** Cereals, products of milling industries live animals, edible vegetable, roots live animals, edible fruits and nuts, coffee, tea, coltan, wolfram, hides and pyrethrum, other minerals, petroleum products, animal or vegetable fats and oils and their cleavage products, beverages, spirits, and vinegar.

Low technology manufactures (Textile/fashion cluster and Other low technology); Textile fabrics, textiles and textile articles, cosmetic products, wood and articles of woods, pulp of paper or paperboard, plastic products and articles thereof.

Medium technology manufactures (Automotive products, Medium-technology process industries and Medium technology engineering industries); Iron and steel, scraps iron, handcrafts, footwear, plastics, iron, and pipes/tubes.

High technology manufactures (Electronics and electrical products); Office/ data processing, Re-exports: gears and machines, power generating types of equipments, vehicles and other re-exports (Sanjaya, 2000).

III. RESEARCH METHODOLOGY AND DATA

The analysis in this study is based on time series data for Rwanda, macroeconomic determinants chosen in this study have the significant impact on the technological structure of manufactured exports, and an econometric model will be used. The data collected on the base of consulting publications of the National Institute of Statistics of Rwanda data profile and World Development Indicators during the period of 1987 up to 2017, we use time series data and STATA as software used to produce tables. We define the variables before the model is set up:

HTM (High-technology manufactured exports index) = High technological structure products / Total exports value (3)

EXP (Ratio of total exports value) = Foreign – invested enterprises / Total exports value (4)

And **FDI (FDI inflows ratio)** as an independent variable, while HTM & EXP are the dependent variables. For the testing of the long-run relationship between these variables, we expend co-integration proficiencies, for the focus of causality; we expend Error Correction Model (ECM) and Granger causality methodological analysis. To prove whether FDI Granger causes the EXP or HTM growth vice versa, this research enforces the causality test formulated by TORAYEH, (2011). Three forms of causality constitute discerned: (a) unidirectional causality from X to Y; (b) unidirectional causality from Y to X; (c) bi-directional causality; and (d) no causality. More specifically, proves for Granger causality is established on the coming VAR model:

$$Y_{1t} = b1_0 + a_0X_t + b2_0Y_{2t} + \sum_{i=1}^{p} m_{j-1}\ ajX_{t-j} + \sum_{i=1}^{q} n_{2j-1}\ b2iY_{t-i} + \sum_{i=1}^{q} n_{1j-1}\ b1iY_{1t-i} + \omega_{0t} \quad (5)$$

$$Y_{2t} = b2_0 + a_0X_t + b1_0Y_{1t} + \sum_{i=1}^{p} m_{j-1}\ ajX_{t-j} + \sum_{i=1}^{q} n_{1j-1}\ b1iY_{1t-i} + \sum_{i=1}^{q} n_{2j-1}\ b2iY_{2t-i} + \omega_{1t} \quad (6)$$

$$X_t = c_0 + d1_0Y_{1t} + d2_0Y_{2t} + \sum_{i=1}^{p} m_{1j-1}d1jY_{1t-j} + \sum_{i=1}^{p} m_{2j-1}d2jY_{2t-j} + \sum_{i-1}^{q} n_{i-1}ciX_{t-1} + \omega_{2t} \quad (7)$$

Where Y_1t & Y_{2t} denote the logarithm of HTM & EXP while X_t denotes the logarithm of FDI, ω_{0t}, ω_{1t}, and ω_{2t} constitute reciprocally unrelated white noise series. The null hypothesis to be proved constitute $aj=d_1j=d_{2j}=0$, which means that HTM & EXP do not Granger causes FDI and FDI also do not Granger cause HTM & EXP towards totally j (j=o,1...m). Whenever in no way the hypothesis is refused, it intends that HTM & EXP do not Granger causes FDI and FDI do not Granger causes HTM & EXP. For hypothesis is rejected, it proves that HTM & EXP Granger causes FDI. Rejection of the 2nd hypothesis intends that the causality moves from FDI to HTM & FDI. If all hypotheses are rejected, there is bi-directional causality between HTM or EXP and FDI. Before carrying the causality test, we want to assure that variables series equal stationary and therefore equal co-integrated together.

To test if these variables are non-stationary or stationary (unit root test), these hypotheses (Null hypothesis H_0: variable is not stationary or getting unit root while alternative H_1: variable is stationary or does not have unit root) are used. In case of Augmented Dickey-Fuller test (ADF) test, there are many create a problem of autocorrelation, the following models are used:

$$Delta * y_t = \alpha_1 + dy_{t-1} + ai + e_t\ (for\ intercept\ only) \quad (8)$$

$$Delta * y_t = \alpha_1 + \alpha_{2t} + dy_{t-1} + ai + e_t\ (for\ trend\ and\ intercept) \quad (9)$$

$$Delta * y_t = dy_{t-1} + ai + e_t\ (for\ no\ trend, no\ intercept) \quad (10)$$

The alternate hypothesis for stationary involves that significantly $\alpha_1 < 0$. If the absolute values of the computed t-statistics for y outperform the absolute critical measure, and so the null hypothesis that the degree of the series doesn't constitute stationary must be rejected versus its alternative. In this event, our variable is stationary. If the computed t-statistics *y* is less than the vital measure, the null hypothesis of the unit root cannot be rejected. A standard Granger causality would be applied and the estimated model would be applied in the case of stationary.

A co-integration test is carried out to determine if a long-term relationship exists when all the variables are non-stationary in levels and are stationary in first differences. Causality tests have been executed by using an error correction model when co-integration is observed. If no co-integration is detected, then the model has to be estimated in the first differences and the standard Granger causality test is used. We have executed the unit root test applying the ADF. This test is established on the estimate of the adopting regression (TORAYEH, 2011):

$$\Delta X_t = \alpha_0 + \alpha_1 X_{t-1} + \alpha_2 t + \sum_{i-1}^{p} Y_{1j} X_{t-j} + \sum_{i-1}^{p} Y_{2j} X_{t-j} + \Delta X_{t-j} + \varepsilon_t \quad (11)$$

Equation (11) is a random pass on intercept and time trend, where $\Delta X_t = X_t - X_{t-1,}$ and X is the variable under circumstance (log of FDI or log of HTM & EXP), ΔX is the first deviation of *X* series, Δ is the first difference operator, p equals the number of lags in the dependent variable, α_0 equals the constant term, t equals the linear time trend and ε_t equals the stochastic error term. In order that X and Y have any type of causality, they must be co-integrated. Such presumption can be supported by applying either the Engle-Granger dance co-integration process or Johansen-Juselius rank-difference co-integration test. Some of them are established on the null hypothesis of no co-integration (TORAYEH, 2011).

The Engle-Granger two-step processes require two stages to explore for co-integration between the variables. On the first stage, non-stationary series are guessed by applying the Ordinary Least Squares method. The co-integration regressions for three time-series can be composed as complies (TORAYEH, 2011):

$$Y_{1t} = \beta_0 + \beta_1 X_t + \beta_2 Y_{2t} + \omega_{0t} \quad (12)$$

$$Y_{2t} = \gamma_0 + \gamma_1 X_t + \gamma_2 Y_{1t} + \omega_{1t} \quad (13)$$

$$X_t = \alpha_0 + \alpha_1 Y_{1t} + \alpha_2 Y_{2t} + \omega_{2t} \quad (14)$$

Subsequently the estimate, in the second step the unit root procedure is enforced to test the stationarity of error processes of the co-integration regressions equations (11 and 12) to decide whether the guessed measures of the residual terms (ω_{0t}), (ω_{1t}) and (ω_{2t}) in former step constitute stationary. (Y_{1t}), (Y_{2t}) and (X_t) are co-integrated and interrelated with each other in the long run when the analyses enable to reject the null hypothesis. By the draw test, the null hypothesis is at about *r* distinct co-integrating vectors. The upper limit likeliness ratio places another way, the max Eigen-value statistic, for testing the null hypothesis of at most *r* co-integrating vectors against the alternative hypothesis of *1+ r* co-integrating vectors.

If the series is obtained co-integrated by either Engle-Granger approach or Johansen-Juselius approach or both, there must exist an associated error correction mechanism including an error correction term (ECT) obtained from the applicable co-integration regressions. This is applied as an adjustment of the state of the equilibrium is anticipated to be negative. The error correction models that arise from the long-run co-integration relationship are determined as in equations (13) and (14) as follows:

$$\Delta Y_{1t} = \beta_0 + \sum_{i=1}^{p} \beta_{1i} \Delta Y_{1t-i} + \sum_{i=1}^{q} \beta_{2i} \Delta Y_{2t-i} + \sum_{i=1}^{q} \beta_{3i} \Delta X_{t-i} + \beta_4 EC_{1t-1} + \beta_5 \varepsilon_1 \quad (15)$$

$$\Delta Y_{2t} = \gamma_0 + \sum_{i=1}^{p} \gamma_{1i} \Delta Y_{2t-i} + \sum_{i=1}^{q} \gamma_{2i} \Delta Y_{1t-i} + \sum_{i=1}^{q} \gamma_{3i} \Delta X_{t-i} + \gamma_4 EC_{2t-1} + \gamma_5 \varepsilon_2 \quad (16)$$

$$\Delta X_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i} \Delta X_{t-i} + \sum_{i=1}^{q} \alpha_{2i} \Delta Y_{1t-i} + \sum_{i=1}^{q} \alpha_{3i} \Delta Y_{2t-i} + \alpha_4 EC_{3t-1} + \alpha_5 \varepsilon_3 \quad (17)$$

Where Δ denotes the first difference operator, EC_{1t-1}, EC_{2t-1} &EC_{3t-1} are error correction and $\mathcal{E}_1$, $\mathcal{E}_2$ & $\mathcal{E}_3$ are random disturbance terms. The error-correction terms EC_{1t-1}, EC_{2t-1} & EC_{3t-1} evaluate deviations of the series from the long-run equilibrium relatives. The coefficients, $\beta_{4,}$ γ_4 & α_4 are required to catch accelerate of variables adjustments (FDI and HTM & EXP or Y_1, Y_2 & X) towards long-run equilibrium (TORAYEH, 2011). While the coefficients of the lagged independent variable in the three equations describe the short-run causal, the comprehension of the error-correction terms inequalities (15, 16 & 17) inserts an additional channel by which Granger causality could be discovered in the long run.

IV. RESULTS AND DISCUSSION

This section is devoted to results presentation analysis and interpretation by Unit Root Test for Stationary of data, co-integration test, and Granger causality test.

A. ADF (Augmented Dickey-Fuller) test

For analyzing the co-integration test on the following variables: LnFDI, LnEXP, and LnHTM with STATA, we need to test the stationary of these time-series data with the Unit Root test method. The result is shown in the following table:

Table 1: ADF Unit Root Test results

Variables	t-statistics			5% critical values			Conclusion
	Intercept only(1)	Trend and Intercept(2)	No intercept(3)	Intercept only(1)	Trend and Intercept(2)	No intercept(3)	
LnFDI	-1.272	-3.065	-0.549	-2.986	-3.58	-1.95	Non- Stationary
ΔLnFDI	-10.255	-10.456	-10.164	-2.989	-3.584	-1.95	Stationary
LnEXP	-0.022	-2.94	-1.164	-2.986	-3.58	-1.95	Non- Stationary
ΔLnEXP	-6.595	-6.85	-6.255	-2.989	-3.584	-1.95	Stationary
LnHTM	-2.171	-2.203	-1.414	-2.992	-3.588	-1.95	Non- Stationary
ΔLnHTM	-8.292	-8.142	-8.435	-2.989	-3.584	-1.95	Stationary

Δ denotes the first difference operator

As shown in Table 1, all the variables don't reject the hypothesis, where the hypothesis was H_0 is unit root/not stationary while (Alt) H_1 not unit root/ stationary, there exist unit root at the 5% significance level, all variables are no stationary at 5% critical values. Although, the first difference of all variables is stationary at 5% critical values. Consequently, we can precede the next step of the co-integration test analysis.

B. Co-integration test

Two variables are co-integrated if they have long-term or long-run equilibrium or relationship between them. Furthermore, the Johansen maximum method is based on the VAR model to estimate and test the co-integration among variables is used. Co-integration test result is shown by the following table:

Table 2: Johansen Co-integration Test results

Variables	No. of co-integration equations	Trace statistic	5% critical values	Conclusion
LnFDI, LnEXP	1	11.0388	15.41	Co-integration
LnFDI, LnHTM	1	7.7352	15.41	Co-integration
LnEXP, LnHTM	1	12.5011	15.41	Co-integration

Note: The optimal lag length is 2, H_0: no-co-integration (trace >5%), while H_1: co-integration (trace <5%)

As shown in Table 2, with 5% critical values, there's only 1 co-integration equation for LnFDI and LnEXP, LnFDI and LnHTM, LnEXP, and LnHTM. According to the result found in table 2, these variables have long-term or long-run equilibrium. On top of that, this test proves the probability of FDI to optimize the high technological structure of Rwanda manufactured exports.

C. Granger causality tests

A way used to investigate causality between two variables in a time series. It's also closely related to the idea of cause and effect, where variable X is causal to Y if X is the cause of Y or Y is the cause of X. Granger causality test result is shown by the following table:

Table 3: Granger causality Wald tests

Test (Null= 0 0r Alt≠ 0)	Lag	Prob > Chi 2	Causality
Lagged LnEXP doesn't cause LnFDI	6	0.002	Exist
Lagged LnFDI doesn't cause LnEXP	6	0.002	Exist
Lagged LnHTM doesn't cause LnFDI	6	0.108	Not exist
Lagged LnFDI doesn't cause LnHTM	6	0.000	Exist
Lagged LnHTM doesn't cause LnEXP	6	0.000	Exist
Lagged LnEXP doesn't cause LnHTM	6	0.000	Exist

Note: Conclusion are drawn at the significance level of 5%

Table 3 shows that at the significance level of 5% and lag length of 6, manufactured exports of Rwanda influence foreign direct investment inflows and high technology manufacturing influence Rwanda manufactured exports respectively. As well as, FDI causes HTM to increase or decrease position but HTM cannot cause FDI anymore in the Rwandan economy. In, the conclusion, on the one hand, FDI has a great contribution to Rwanda manufactured exports; on the other hand, it contributes less to high technological structure manufacturing.

V. CONCLUSION AND IMPLICATIONS

This study provided a time series relationship analysis between Foreign Direct Investment inflows and high-technological structure of manufactured exports in Rwanda. The empirical findings of this study show that inward FDI has significantly contributed to better the manufacturing export performance of Rwanda between 1987-2017 and as well as are contributed significantly in enhancing technological structure performance during the same period. With VAR (1), the results clarify that there is long-term or long-run equilibrium (co-integrated) between FDI inflows and high-technological manufactured and manufactured exports.

Bruno (2013) made a research on ''FDI and Economic Growth in Rwanda: A Time Series Analysis'', with VAR (1) model, he established that GDP and FDI were co- integrated of order one, suggesting the existence of a long-run dynamic equilibrium relationship between the two series. Furthermore, the reference Sung et al., (2008) used OLS regression and suggested that GDP and trade openness have a significant positive impact on Rwanda's FDI inflows. However, arguments put forward by Huang, (2003) and Rudolph, (2006) suggest that giving importance to FDI inflows alone will not lead to any benefits for the domestic manufactures.

The main force of Rwanda's export products has transferred from primary products to manufactured products, but this is the trend that indicate high technological structure of Rwanda's manufactured exports, on top of that FDI inflows, is attracted to increase quality and quantity of the manufactured exports such as most of manufactured export products are Low technology manufactured exports, Medium technology manufactured exports, and High-Technology manufactured exports have advanced and fast-changing technologies, with high Research and Development investments and prime emphasis on product design. Most importantly, the Government of Rwanda must recognize that FDI inflows can only complement domestic efforts to meet development objectives, they alone cannot do wonders.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

Data of LnFDI, LnEXP & LnHTM and their first difference

Year	LnFDI	ΔLnFDI	LnEXP	ΔLnEXP	LnHTM	ΔLnHTM
1987	0.815488	.	7.450053	.	0.190368	.
1988	0.87861	0.063122	6.61956	-0.83049	0.364817	0.174449
1989	0.644843	-0.23377	6.139289	-0.48027	0.451972	0.087155
1990	0.296541	-0.3483	5.614609	-0.52468	0.264069	-0.1879
1991	0.239484	-0.05706	7.316604	1.701995	0.939988	0.675919
1992	0.107814	-0.13167	5.568408	-1.7482	1.139864	0.199876
1993	0.2968	0.18899	5.175246	-0.39316	2.241325	1.101461
1994	0.000133	-0.29667	6.302586	1.12734	3.368463	1.127138
1995	0.17102	0.170887	5.150792	-1.15179	2.006849	-1.36161
1996	0.160471	-0.01055	6.03137	0.880578	0.598881	-1.40797
1997	0.140344	-0.02013	7.797339	1.765969	3.096849	2.497968
1998	0.356358	0.216014	5.585064	-2.21228	2.166976	-0.92987
1999	0.094942	-0.26142	6.260389	0.675325	0.601955	-1.56502
2000	0.479501	0.384559	6.319814	0.059425	2.468931	1.866976
2001	0.276717	-0.20278	8.468308	2.148494	1.523142	-0.94579
2002	0.155584	-0.12113	7.041182	-1.42713	83.64026	82.11712
2003	0.254577	0.098993	8.452632	1.040812	27.00414	-56.6361
2004	0.368604	0.114027	11.12327	2.670638	19.88993	-7.11421
2005	0.40677	0.038166	11.42612	0.30285	25.34354	5.45361
2006	0.972107	0.565337	12.14994	0.72382	16.28882	-9.05472
2007	2.151313	1.179206	15.66466	3.51472	16.33284	0.04402
2008	2.126421	-0.02489	12.54915	-3.11551	6.713898	-9.61894
2009	2.206203	0.079782	11.7338	-0.81535	11.63874	4.924842
2010	4.339185	2.277155	12.03931	0.30551	5.368463	-6.27028
2011	1.814712	-2.52447	13.64542	1.60611	6.160386	0.791923
2012	3.476021	1.661309	12.78688	-0.85854	4.939988	-1.2204
2013	3.380281	-0.09574	14.09042	1.30354	6.516412	1.576424
2014	3.926137	0.545856	14.72211	0.63169	11.89914	5.382728
2015	2.698056	-1.22808	14.24274	-0.47937	12.98356	1.08442
2016	3.14193	0.443874	14.92695	0.68421	12.28155	-0.70201
2017	3.211372	0.069442	18.243	3.31605	14.33284	2.05129

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