Trade Openness and Economic Growth in Rwanda
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Working Paper

Abstract

This paper examines empirically the impact of trade openness on the economic growth in Rwanda for the period between 1980 and 2017. It examines the short and long-run causality between trade openness and economic growth. The analytical framework of this study is embedded in the theoretical and empirical debate between three dominant theoretical approaches about trade openness and economic growth: the Ricardian- HecksherOhlin trade Theory, Endogenous Growth Theories, and the Absolute Advantage Theory. The study finds that the three theories are complementary and mutually exclusive in explaining the relationship between international trade and economic development. The findings of this study reveal a positive and statistically significant impact of trade openness on economic growth in Rwanda. The results reveal plausible evidence of unidirectional long-run causality, running from trade openness to GDP per capita in Rwanda. And economic growth is significantly error-correcting at 39.6% annually. The results imply that economic growth in Rwanda changes significantly in the short equilibrium influenced by changes in the trade openness. The evidence from this study suggests that the institutional and policy framework is equally important in causally conditioning the overall growth impact of trade openness in Rwanda, as well as the imperative of export diversification of her export commodities.

Keywords: Trade Openness, Rwanda, Economic Growth
Background

The effect of trade openness on economic growth continues to be a heated debate among scholars and policymakers, until today. Theoretical narratives seem to concur on the premise that trade openness influences economic growth if viewed through international trade and endogenous growth theories. The same empirical studies however remain mixed when it comes to their causal mechanisms. The literature is yet to come to the empirical conclusion about the causal mechanism on how trade openness affects economic growth mostly in developing countries. Recent debates pay less attention to the country context and the causal mechanism related to the two concepts. This study examines the impact of trade openness on economic growth in Rwanda.

African countries have recently experienced exponential economic growth (average at 5%) and East African countries (EAC) have demonstrated a lead in this growth rate (averagely 5.9%) compared to other regions of Africa. There are growing policy and scholarly narratives in support of the positive effects of trade openness on the continent. Regionally, EAC seems to be leading other African regional communities in terms of trade openness focusing on the structural shift to improve exports and economic growth. By trade openness, we refer to the rate at which countries are open to the international trade proxied by the summation of exports and imports to GDP per capita (AfDB, 2018). According to the World Bank dataset, in the year 2017 total exports were US$ 212 million while total imports are US$ 227 million in SSA countries with a negative balance of US$ 15.7 million. In Rwanda, exports increased from 202.5 million USD in 1980 to 1.8 billion USD in 2017, correspondingly, imports increased from 176.5 million USD to 4.4 billion USD. Subjected to GDP, during the same period, the percentage of exports increased moderately from 14.4% to 18.2% of GDP and imports increased from 26.3% to 32.7% of GDP respectively (World Bank, 2018).

1 (African Development Bank, 2018), East African Economic Outlook, Macroeconomic Development; Manufacturing`s Competitive Advantage and Competitiveness
Right after the genocide against Tutsi, Rwanda embarked on an ambitious policy strategy of promoting international trade as a strategy to realize country’s development goals as enshrined in the Vision 2020, Economic Development Poverty Reduction Strategies (EDPRS) and National Strategy for Transformation one (NST1). Policies, instruments, and laws have been put in place to promote trade and doing business in Rwanda. In this regard, many institutions have been set-up to catalyze trade and business development in Rwanda. For instance, Rwanda Development Board (RDB), National Agriculture and Export Promotion Board (NAEB), National Industrial Research and Development Agency (NIRDA) to mention but a few. Ministries have frequently been restructured to suit the policy demand for trade and business openness in the country. Rwanda has joined many regional and international bodies for example EAC, COMESA, CPGL, AU, AfCFTA to mention but a few purposely to promote trade and development in the country. Many international agreements have been signed with other countries or international bodies in that regard. More so, policies and laws have been developed as well as infrastructures geared to facilitate the value chain of trade locally and abroad. These pro-trade openness policy interventions prompt scholarly demand to examine the policy outcomes of such development interventions in Rwanda.

Theoretically, exports remain imperative in terms of influencing the economic growth of countries. Similarly, scholars claim that considering the determinants of the Economic growth of countries, the growth of countries can be stimulated not only by promoting factors of production but also by increasing export volumes. Accordingly, Yuqing and Manisha, (2013), argue that exports are increasingly becoming one of the sources of foreign earnings of developing countries. Reference to the pioneering theories of David Hume (1752), Adam Smith (1776), David Ricardo (1817), Heckscher (1919) and Olin (1933), Linder (1961), Keynes (1936) and many others modern theorists of international trade, they hypothesized that international trade enhances productivity; and indirectly boost conditions of living. Thus, international trade is seen in theory to promote the argument that external trade enhances welfare in economies.

However, the empirical literature remains mixed regarding the role of exports in promoting economic growth in developing countries. Between the early 1960’s and the early 1980s, many
African countries operated highly interventionist trade regimes on both import and export sides (Sophie Chauvin and Guillaume Gaulier, 2002). Similar authors argue that in some instances international trade is characterized by prohibitive measures such as exchange controls. More so, United Nations (2003) find that, over the last three decades, international trade has moderately increased growth in the Sub-Saharan Africa (SSA) region, and similarly the share of exports (to GDP per capita) increased moderately. Indeed, (Omolo, 2011:7) insert that "Trade openness can take different forms; it can be preferential, such as regional trading agreements which are specific to countries or a region like the East African Community (EAC) customs union, or the Common Market for East and Southern Africa (COMESA)."

In line with the above, Africa’s economic prospects for 2009 were reduced as a result of joining international trade. As a result, the continent recorded a slowed real GDP growth of 1.9% in 2009 compared to 5.2% in 2008. The Economic Survey (2010) indicates that the region is affected due to its reliance on primary commodity exports in the face of contraction in global demand and declining prices. The World Bank (2018:10) note that "in Rwanda’s merchandise exports remain concentrated in a few key commodities (traditional exports) sectors – tea, coffee, and mineral." And have characterized Rwanda’s export volumes in the last two decades. For instance, according to the World Bank (2017), Rwanda’s exports have increased four-fold in the last decade from US$400 million in 2007 to US$1.6 billion in 2016. Exports to the region highly flow to the DRC and EAC countries characterized by re-export products. The country continues to embark on its export growth through its driven international trade policies.

In terms of the balance of payment management, expanding exports, and reducing the Balance of Payment (BoP) has long been a government policy priority for Rwanda to ensure strong economic development. The government has been highly proactive in its promotion of exports, leading to years of considerable export growth. This is evidenced by the recent positive progress in terms of reducing the balance of payment deficits. Many policy interventions are being implemented such as “Made in Rwanda”, to improve the perceptions and consumption of Rwandan products, promote nascent industries, and boost the productivity of exporting
sectors. More investors are being attracted to promote production, value addition, and export promotion along the whole value chain of international trade. However, even though Rwanda adopted many policy initiatives-that have stimulated export promotion and reduced imports to the country. These initiatives account for the country as an open economy to trade and business thus little remains known empirically about the pay-off of these economic policies to Rwanda’s recent economic performance among policymakers and scholars. Does trade openness provide an economic dividend to Rwanda’s economic performance? Looking at the empirical studies, you find inconclusive debate, and the underlying point is the causal relationship in the empirical debates and analysis. Some argue that opening up of the country’s economy stimulates economic growth, while others argue reversely, claiming that the rate at which the economy grows influence positively trade openness which in turn affect economic growth- hence the reverse causality. Thus, the underlying empirical puzzle is the long-run causal relationship between trade openness and economic growth in developing countries like Rwanda.

In line with the above, empirical literature thinly provides the causal relationship between trade openness and economic growth. This is also attributed to the consistent underestimation of contextual aspects in the empirical analysis. These empirical gaps contribute to the ongoing empirical debate about the topic. This study considers these mixed empirical debates and contributes to this body of knowledge by examining the long-run causal relationship between trade openness and economic growth in Rwanda for the period from 1980-2017.

**Literature Review**

The relationship between openness and economic growth was, until recently, situated and assessed in the theoretical framework of international trade and growth theories. International trade or trade openness is factored-in in these theoretical frameworks as a determinant of technological progress and output growth. This chapter reviews these theories in the lens of trade openness- how trade openness is factored-in to explain economic growth and development. In this chapter, we review traditional Ricardian-HecksherOhlin trade theory,
Endogenous Growth Theories, and Absolute Advantage Theory, and empirical debates about trade openness and economic growth.

_Ricardian-Hecksher-Ohlin trade Theory_

The Ricardian-Hecksher-Ohlin trade Theory appears to be the early neoclassical theory of trade and development—which other proceeding theories are based on. This theory points out that trade openness brings only a one-time increase in output, since the country allocates its resources more efficiently after the openness, conditional on comparative advantage. The theory is also based on the theory of comparative advantage, which postulates that trade allows more efficient use of the economy’s resources by enabling imports of goods and services that could otherwise only be produced at home at higher resource costs (Ulasan Bülent, 2008). For instance, (Frederico, 2001) claims that trade enables developing countries to import capital and intermediate goods – critical to long-run economic growth – that would be quite expensive to produce locally. Frederico further argues that the traditional case for the gains of trade is based on comparative advantage, in which a country that opens up can be assured the benefits of welfare gains in a static model. In the same vein, the Ricardian model explains the welfare gains if any country specializes in producing goods in which it has a comparative advantage.

The Hecksher-Ohlin-Samuelson (H-O-S) model, on the other hand, shows the welfare gains in the two-country model that each country specializes in based on their factor endowments. The key take-away of these theories is that international trade is the way to achieve static productivity efficiency and international competitiveness. Frederico (Frederico, 2001) reminds us that economic growth is only a result of this strategy. Although productivity efficiency and international competitiveness can be achieved, it is not clear, under the Ricardian or the H-O-S model, whether and how international trade determines economic growth in the long run (see all in Ulasan Bülent, 2008).

However, the theory exhibits some shortcomings. Accordingly, Bulent Ulasan (2018) argues that this theory does not suggest any certain implications for long-run growth. As noted by the
neoclassical growth model the growth rate of per capita output is determined by the
exogenous technological progress. Neoclassical growth model claim that an increase in the
savings rate generates a temporary rise in the growth rate. Trade openness may impact the
long-run growth rate if there is a technology stimulating effect on openness. However, neither
the traditional Ricardian-Hecksher-Ohlin trade theory nor the neoclassical growth model
provides a theoretical framework for the proposition that openness stimulates technological

Others claim that the theoretical framework between export expansion and economic
growth remain inconclusive. First, exploiting economies of scale and greater capacity utilization
are static effects of exports on economic growth. These effects run in a short period after the
export expansion, yet do not provide higher steady-state growth rates. Second, there is no \textit{a
priori} reason for the belief that exports induce superior technology and hence increase
productivity. Similarly, the effect of exports on economic growth through physical capital
accumulation is not clear. In other words, there is no clear answer to why export expansion
leads to an investment boom theoretically Kiganda, E.O. el. (2017). This has also been advanced
by Adam Smith’s absolute advantage theory as put forward by Sen (2010) who recognized the
standard theory of international trade.

More so, Emeka (2010, cited in Ulasan Bülent, 2008) asserts that the doctrine that trade
enhances welfare and growth has a long and distinguished ancestry dating back to Adam Smith
(1723-90). In his book, and inquiry into nature and causes of the wealth of nations (Adam
Smith, 1776), Smith stressed the importance of trade as a vent for surplus production and as a
means of widening the market thereby improving the level of productivity. Smith further
asserts that “between whatever places foreign trade is carried on, all of them derive two
distinct benefits from it”. Emeka (2010) further summarized the absolute advantage theory of
Adam Smith that countries should specialize in and export those commodities in which the
trading partner has an absolute advantage. These theoretical narratives have informed the
growing empirical literature about trade and economic development.
Endogenous Growth Theories

Endogenous growth theories emerged greatly from the contributions of Romer (1986) and Lucas (1988), where they stress the role of capital accumulation on long-run economic growth (see Ulasan, 2008). The rationale of the theory emerges from its theoretical framework about the determinants of economic growth. As it has been argued by Ulasan (2008), in contrast to the neoclassical growth model, endogenous theories define capital more broadly and included ideas (or knowledge), learning-by-doing, and human capital. The importance of endogenous growth models is that the accumulation of capital is not subject to diminishing returns and is thus central to long-run growth. These theories explain that factors of production (technology, knowledge, capital, labor) determine total factor productivity and aggregate output-hence economic growth. Trade openness comes into play as a critical contributor to the factors of productions such as capital and technological progress when an economy opens up. In the framework of endogenous growth theories, trade openness has four different effects on long-run economic growth:

i) Communication Effect: Openness to international trade provides channels for communications with foreign counterparts that facilitate the transmission of technology.

ii) Duplication Effect: In the absence of international trade some ideas and technologies are duplicated in many countries. Openness encourages firms to invent new and distinct ideas and technologies preventing duplication of R&D effort.

iii) Allocation Effect: Trade openness leads countries to specialize according to traditional (Ricardian- Hecksher-Ohlin) comparative advantages which are determined by factor endowment. Hence, the relative domestic prices of factors will change after the trade openness (due to the Stolper-Samuelson theorem). If a country has a comparative advantage in a sector that is unskilled labor-intensive (e.g. final good 2), trade openness reduces the domestic relative wage of skilled labor compared to unskilled labor. This leads to a rise in the level of R&D activities, and hence in the long-run growth rate because the cost of R&D decreases and/or the fraction of skilled labor endowment employed in R&D increases. Exactly, the opposite is true in a country that specializes in skilled labor-intensive goods (say final good) (Grossman and Helpman, 1991; Rivera-Batiz Romer, 1991citted in Ulasan, 2008).
iv) **Integration Effect**: Trade openness increases the size of the market available to firms. Assuming intermediates are traded across countries as well as final goods, the enlarged market size of the R&D sector raises R&D activity and hence economic growth since this sector is subject to increasing returns to scale (Feenstra, 1996, cited in Ulasan, 2008). On the other hand, after trade openness, the domestic R&D sector will face foreign competition and hence this sector may lose market share at home leading to a slowdown in economic growth. For instance, assuming intermediates are not traded, Feenstra (1996) concludes that the integration effect is not beneficial to smaller countries. Alesina et al. (2000, 2005) develop a theoretical model such that there is an inverse relationship between openness to international trade and country size.

Therefore, Ulasan, (2008:12) concludes by claiming that, "influence of openness to international trade on long-run economic growth depends on the magnitude and dominance of these different effects."

**Absolute Advantage Theory**

The absolute advantage theory has been promoted by Adam Smith (1776) and Ricardo (1817). According to Ricardo, countries should allocate their scarce resources and specialize in the production of goods and services for which they have a comparative cost advantage. According to Adam Smith (1776, cited in Albiman, 2014) in his publication of *wealth of nations* argued that each country should specialize in productions of goods and services in which it has absolute advantage. Each Country should export goods and services in which it has absolute (less cost per unit) .Country should imports commodities in which it has higher absolute disadvantage (cost per unit). From this fact, each nation would gains from trade in terms of welfare. However, the theory fails to explain how trade can occur if there is absolute advantage in both countries? This was raised by David Ricardo in his theory of comparative advantage (Kiganda, 2017)

Furthermore, Smith stressed the importance of trade as a vent for surplus production and as a means of widening the market thereby improving the level of productivity (Adam, 1776 cited in Kiganda, 2017). Similarly, Emeka, (2010) summarized the absolute advantage theory of Adam
Smith that countries should specialize in and export those commodities in which the trading partner has an absolute advantage. That is to say, each country should export those commodities it produced more efficiently.

However, classical ideas of Adam Smith and Ricardo ignore other aspects of international trade such as the consequences of balance of payment deficit. More to that, though the theory holds that trade openness influence economic growth but, thinly explains the causal mechanisms through international trade influence economic performance of countries.

In sum, the three theoretical frameworks theoretically explain how trade openness and international trade effect growth through enhancing factors of production and technological progress, thus increasing productivity by increasing the four effects of international trade and by allowing countries to trade in goods and services of which they have comparative advantage on the international market.

**Trade Openness and Economic Growth: An Empirical Review**

This section reviews different empirical debates related to the trade openness and economic growth based on the international trade theories discussed here above. The correlation between trade openness and economic growth has remained a concern of controversy and verification by academics and researchers in recent years (see Vasiliki Pigka-Balanika)\(^2\). For many authors trade openness implicitly implies trade policy stance driven by liberalization orientation to influence economic growth. While other scholars claim that, trade openness is a complex concept dealing with a set of internal country policies (macro and institutional policies) target the overall liberalization of country`s economy- internally and externally (see all Marilyne Huchet et al, 2013).

In the same vein, previous empirical findings indicate positive relationship between trade openness and economic growth (Grossman and Helpman, 1991, cited in RAYMOND ABABIO, 2015). Similarly, they propose that trade can influence growth through several channels including technological innovation. Trade openness also leads to more exposure of the domestic economy, in which increased and sustainable international trade allows domestic

\(^2\) [https://pdfs.semanticscholar.org/.../d920821809ba4b282f2004d3ae5c026db](https://pdfs.semanticscholar.org/.../d920821809ba4b282f2004d3ae5c026db) accessed on 20th August 2019
producers to learn, adopt, or imitate foreign technologies and adopt technological innovation into production processes. In their estimation, trade can help transmit technological innovations and knowledge among trading partners. Accordingly, Ahmadi and Mohebbi (2012) find positive effect of trade openness in Iran for the period 1971-2008. Similarly, Domirhan and Akçay (2005) find positive effect of trade openness on economic growth in the nine selected Middle East and North African (MENA) countries. Their results indicated unidirectional causality running from openness to economic growth in three MENA countries (Egypt, Jordan and Syria). Though, causality analysis is employed, inconclusive findings are observed, which seem to be attributed to failure to conduct correlation and cointegration analysis. Kiganda et al., (2017) employed cointegration and error correction model analysis to analyze effect of trade openness in Kenya and found a significant positive effect, and unidirectional causality between two variables. And economic growth is significantly error correcting at 34.7% annually.

Classical and neoclassical economists reiterate the positive effect of trade openness on the economic growth. In doing so, openness of trade increase economic growth by improving per capita income, promoting technological progress, encourages efficient allocation of resource, which stimulates economic growth (see Adam Smith, 1937, David Ricardo, 1973). Empirical evidences suggest that liberalized economies promote economic growth, and export market access. Openness raises imports and exports of goods and services and improves domestic technology. Hence, production process is more effective and productivity rises. As a result, economies open to world trade with growth rate more than the closed economies. For this reason, Ben-David and Loewy (1998) proposed that trade barriers should be decreased for an economy to grow. The greater the growth effects, the more countries enact trade barriers reduction policies.

Furthermore, several empirical narratives claim positive correlation between the growth rate of GDP with the growth rate of trade openness (Edwards, 1992; Wacziarg, 2001; Sinha and Sinha, 2000). Though, debate related to the causal links between two variables is still ongoing. Empirical evidence tends to show that in the long run more outward oriented countries register higher economic growth performances (see Sachs and Warner, 1995; Edwards, 1998; Frankel and Romer, 1999; Dollar and Kraay, 2004; Lee et al. 2004). More recent empirical evidences find
positive effect of trade openness on income growth influenced by local completing policies (see Chang et al. 2009; Freund and Bolaky, 2008).

However, pessimistic empirical evidences point to the contradicting empirical arguments of the matter. They claim that trade openness has its negative effects. It affect macroeconomic behaviors by inducing exchange rate depreciation which in turn affect aggregate supply and production hence affecting country’s competitiveness (Adhikary, 2011). Some empirical studies fail to find the positive causal relationship between the two variables. Indeed, Ahmadi et al. (2012) find negative impact of trade openness, institutional variables on economic growth in Pakistan. And negative long-run relationship between real GDP and trade openness. But the results of error correction term (ECT) were statistically significant. Although the authors tried to show trade openness- economic growth relationship, the gap still exists related to the causal relationship and the direction of causality.

In line of the above, (Rodriguez and Rodrik, 1999) claim that, failure to depict robust and positive correlation between openness and growth is attributed to the measurement issues related to the lack of the appropriate control variables. This is all about the methodological issues. For instance, Rodrik et al. (2002) demonstrate that the strong effect of trade on growth, in both (Alcala and Ciccone, 2002; Dollar and Kraay, 2003), comes from their choice of measuring openness by using “real openness”, instead of the conventional measures of openness, which always results in positive biased estimations of openness on growth. In addition to this, it is possible that omitted variables may create a positive relationship between openness and growth (Rodriguez and Rodrik, 2001); Hallak and Levinsohn, 2004). If one includes a geography measure or a measure of institutional quality, then the effect of openness on growth is mitigated and becomes less significant.

Moreover, the contribution of exports in the country’s economic performance and development is widely noted in country’s growth and development. Ideally, opening up of country’s trade of goods and service stimulates growth by increasing production, economies’ of scale, economic efficiency and technological progress embodied in foreign-produced capital goods, learning effects and improvement of human resources, increased productivity through specialization (Basu et al. 2000; Fosu, 1990; Santos Paulino, 2000; and Giles and Williams, 2000)
and creation of employment. Indeed, John Mutenyo (2011:p25) asserts that, an important source of potential growth for African economies is through the exploitation of export opportunities both regionally and internationally. So far, there seems to be a growing consensus about the influence of exports on economic growth in developing countries.

In relation to the Sub-Saharan Africa countries, available evidence point to the growing mixed views about the contribution of trade openness on economic growth in SSA countries. These pessimistic claims stem from the effects of weak institutional framework and the recent emergence of protectionist theories and policies in the developing countries- as it has been promoted by the empirical narratives of Rodrik and Rodriguez, 2001 see BÄulent Ulas.an, 2008). According to the latter authors, the empirical link between trade openness and economic growth is affected by the conceptual and methodological problems as well as lack of robustness about the export-growth linkages. The authors argue that, it is possible to say that the impact of trade openness on economic growth is assessed according to the debate on the merits of alternative trade regimes and this issue became increasingly confused through the late 1980s. In other words, what is meant by trade openness is not clear and sometimes the definition is very sensitive to the assumptions made by the authors. Some authors define openness in narrow terms including only export orientation without considering trade barriers on imports while others define the openness in broad terms encompassing the exchange rate and domestic policies as well as removing trade barriers on import and subsidies on exports.

There is also empirical issue related to causality. Accordingly, there is adverse the issue of causality and simultaneity between exports and economic growth. The question is about the direction of causality, whether it is from export expansion to economic growth, or expansion of the economy contribute to export growth. That is, whether countries grow faster as a result of higher export performance or countries export more because of faster growth remains an open question. Few studies address this issue. Other studies have claimed that, the effect of trade openness is influenced by country policies and cross-country policies within regional trade blocks.

In conclusion, the theoretical and empirical narratives on exports and economic growth remain inconclusive among empirical studies. Various empirical findings either at country or
cross-country level respectively continue to be mixed. This seems to be attributed to the methodological issues in the study and mediating factors influencing export-led growth in developing countries. As result, contribute to the inconclusive empirical claims about export-growth impact in developing countries.

**Research Gaps**

The scholarship of trade liberalization and economic growth has been extensively and theoretically explored by early economists. Its empirical narratives however remain inconclusive. This seems to be attributed to the following three main gaps existing in the field:

First, underestimation of the country-specific context. In line of the latter, Rodrik (2004) added-in also the geography aspect- for instance a country being landlocked in the study. Several studies in the field of cross-country analysis tend to ignore the country specific factors (such as institutional and geographical factors) that do also influence country’s openness to the international trade. We already know that countries are different in terms of policy frame and effectiveness of institutions that shape the rate and intensity by which countries open to the international trade. Also, the location of the country away from the sea does influence its benefits from international trade for instance, the case of Rwanda.

Second, there is also growing methodological issues related to causality. A growing number of empirical narratives argue that trade openness influence economic growth mostly in developing countries. Contrarily, others claim that the more the country perform economically influences how the country is open to international trade which in turn influence economic growth. Hence, the issue of reverse causality- which has remained unsolved. We need to determine the causal path between trade openness and economic growth over time in the empirical analysis mostly in the developing countries such as Rwanda.

Third, there is growing tendency to underestimate the effects of globalization in the analytical frameworks of international trade and economic development. Currently, there is growing mixed views about globalization and its effects. The concept of globalization- which involves trade openness is widely understood differently among countries, policy makers and
scholars. Some have embarked on its negative effects and adopted nationalistic attitudes while others have opted for protectionism (which affect trade openness). Others like Dan Rodrik and John Stiglitz have criticized globalization and its effects. All these diverse empirical and policy views are not yet catered for in the empirical and analytical frameworks of international trade and development mostly in the developing countries like African countries.

Therefore, this study adopts for a realistic and feasible methodological approaches to contribute to the scholarship. The following section discusses methodological and analytical techniques employed in this study to examine empirically how trade liberalization impact growth in Rwanda.

**Empirical Strategies**

This chapter presents theoretical framework and empirical models of the study as well as data description employed in the analysis.

**Theoretical Model**

The analytical framework of this study is informed by the Endogenous Growth Theories which are based on the theoretical model of production function. In this theoretical model, empirical studies employ neoclassical production then include trade openness as a third input, with capital and labor in order to explain country economic growth-expressed in the production function here below.

\[
Y_t = F (K_t, L_t, X_t) \]

Where \(Y\) is level of output, \(K\) is capital stock, \(L\) is labor stock and \(X\) is our trade openness at time \(t\). In this specification, \(X\) replaces the technological progress variable in the original neoclassical production function (see Keho, Yaya, 2017). In other words, technological progress is implicitly assumed to be a function of trade openness. As postulated by the Ricaldo and Adam Smith.

**Empirical Models**

This section presents briefly the methodological techniques employed to examine the causal effects of trade openness and economic growth in Rwanda. As a baseline analysis, an Ordinary Least Square (OLS) technique is employed to examine the effect of trade openness on economic
growth in Rwanda. A set of independent variables such as percentage of foreign direct investment inflows, remittance inflows, gross capital formation, summation of exports and imports to GDP per capita and secondary school enrolment was employed in the model. And GDP per capita used as dependent variable. The above theoretical model informs the empirical model of OLS model here below.

\[ \text{LogY}_t = \beta_0 + \beta_1 \text{LogRem}_t + \beta_2 \text{LogFDI}_t + \beta_3 \text{LogGCF}_t + \beta_4 \text{LogOPEN}_t + \beta_5 \text{LogENR}_t + \varepsilon_t \]  \hspace{1cm} (1)

Where \( \text{LogY}_t \) is measured as the log of real GDP per capita in country \( l \) at time \( t \); \( \beta_0 \) is a constant; \( \text{LogRem}_t \) is a measure of remittances as a share of GDP (as % of GDP); \( \text{LogFDI}_t \) is the measure of foreign direct investments as a share of GDP used to capture the effect of external sources of capital on growth; \( \text{LogGCF}_t \) is the gross fixed capital formation as a percentage of GDP used as a proxy for investment in the physical capital; \( \text{LogOPEN}_t \) is the measure of openness to trade for each country under consideration, measured as ratio of summation of exports and imports to GDP to capture the impact of trade, openness of the economy on economic growth; \( \text{LogENR}_t \) is the measure of school enrollment, measured as secondary enrollments as a percentage of total.

To tease the aspect of reverse causality at the level of OLS, a follow model estimating the effect of economic growth on trade openness is estimated as follows:

\[ \text{LogOPEN}_t = \beta_0 + \beta_1 \text{LogY}_{t-1} + \beta_2 \text{LogRem}_t + \beta_3 \text{LogFDI}_t + \beta_4 \text{LogGCF}_t + \beta_5 \text{LogENR}_t + \varepsilon_t \]  \hspace{1cm} (2)

Where,

\( \beta_1 \text{LogY}_{t-1} \) is the lagged GDP per capita depicting the rate of economic growth in the previous year in the model \( 2. \)

For the purpose of addressing the reverse causality between trade openness and economic growth in Rwanda, the study further employs the cointegration test and error correction model (ECM) to examine the direction of long-run causality between trade openness and economic growth in Rwanda using annual time series data for Rwanda from year 1980-2017. I test for stationarity using ADF test and employ Johansen test of co-integration to examine whether the two-series are co-integrated and have a long-run equilibrium relationship. The underlying main
hypothesis is that; there is long-run relationship between trade openness and GDP per capita, and direction of causality runs from trade openness to GDP per capita in Rwanda. We test the hypothesis using Johansen test of cointegration and error correction model. (Ssekuma, 2011 cited in Kiganda, 2017) argue that Johansen test of cointegration procedure builds cointegrated variables directly on the maximum likelihood estimation instead of relying on OLS estimators and is able to detect more than one cointegrating relationship if present. The number of cointegrating vectors in Johansen procedure are detected by using two likelihood ratio tests namely; the trace test and the maximum eigenvalue.

In the case of error correction model, there is an econometric issue that need to integrate short-run dynamics and long-run equilibrium. Emeka (2003, cited in Kiganda, 2017:9) assert that, “though there may be a long-term, or equilibrium relationship between variables, in the short run there may be disequilibrium.” Therefore, this study employs the Error Correction Model to validate the existence of long-term relationship and correction of the short run disequilibrium. Represented by ECM here below:

\[ \Delta Y_t = \beta_0 + \beta_1 \Delta X_t + \gamma (X_{t-1} - Y_{t-1}) + \mu_t \] ...........................................(2)

Where; \( \Delta Y_t \) is first differenced variable of GDP per capita, \( \gamma \) is the coefficient of error correction term; \( \mu_t \) is a stochastic term representing stochastic fluctuations in data

\( (X_{t-1} - Y_{t-1}) \) is the error correction term and \( \mu_t \) has zero mean given \( \Delta X_t \); \( X_{t-1}, Y_{t-1} \) are all past values of \( X_t \) and \( Y_t \). \( Y_t \) is the Rwandan real GDP per capita and \( X_{t-1} \) are the lags of trade openness. The results will determine the causal direction and long-run relationship between trade openness and economic growth in Rwanda for the period.

Data, Data Source and Data Description
The study employs and uses data from the World Bank Dataset (for world development indicators) with long-term country annual time series data. And other data for descriptive analysis from the National Bank of Rwanda and National Institute of Statistics (NISR) using the institutional reports. For the purpose of empirical analysis, the study uses macro-economic variables such as real GDP per capita (as dependent variable) explained by independent
variables; lagged GDP per capita, percentages of these variables to GDP; remittance inflows, Gross capita formation, foreign direct investments, ratio of summation of exports and imports to GDP to capture the impact of trade openness of the economy on economic growth; ENR_t is the measure of school enrollment, measured as secondary enrollments as a percentage of total; and domestic credit to the private sector to depict the level of financial development in Rwanda, which in one way or another influence local and international trade. The study covers a period from 1980-2017.

**Trade Openness**

This sub-section analyses trends of trade in Rwanda in line with the period of study on different data including trade openness. As extensively discussed in the background chapter, right after genocide against Tustsi until recently Rwandan government initiated and implemented different policy initiatives geared to increase trade openness and doing business in the country. All these initiatives have promoted trade and exports. However, the country continues to be affected by the challenge of consistent balance of payment deficit and weakly competitive on the international market. Accordingly, Rwanda recorded a trade deficit of 130 USD Million in May of 2019. Balance of Trade in Rwanda averaged -182.87 USD Million from 1998 until 2019. To reduce current deficit and realize the national target of 17% annually export growth, Rwanda through National Strategy for Transformation one aims to contribute to a structural shift in the export base to high-value goods and services by implementing the following policy strategies: First, promote more exports regionally and internationally and substituting imports with local goods through “Made in Rwanda” policy. Second, attract potential and catalytic investments that enable local industries to grow and compete. Third, develop and accelerate development of specialized export infrastructures across all the export value chains that increase productivity. Fourth, promote Rwandan exports through targeted marketing and branding of Rwanda export products.

However, Rwanda's exports remain dominated by traditional products such as coffee, tea and minerals like tin, coltan, wolfram and cassiterite, and mainly exported to China, Germany and United States. Rwanda imports mainly food products, machinery and equipment, construction
Despite stable economic growth, Rwanda’s trade deficit has been growing until of recent years it shown it showed slight reversal. The overall economy recorded average growth of 7.3% since 2010, but the trade deficit persisted and grew at average of 7.6% between 2010 and 2015, despite growth in exports over the same period. Finally, in 2016, the goods trade balance improved, shrinking by 5.9%, due to both growth in exports and decline in imports. While the fact that the deficit trend is reversing is an extremely positive development, it is worth observing that the absolute amount of goods and services deficit remains at $1.65bn in 2016, which continues to pose a threat to Rwanda’s overall macroeconomic stability. Building on the current momentum, Rwanda will require improving to the overall competitiveness of the Rwandan economy, to be able to compete both with imports and in export markets (MINICOM, 2016). We observe that, the positive development stems from the country’s policies of

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3 Rwanda Balance of Trade - actual data was last updated on July of 2019 (see https://tradingeconomics.com/rwanda/balance-of-trade).
openness to trade and doing business which bearing positive outcomes in terms economic performance. In this regard, Rwanda is considered as the rising star in SSA countries in terms of openness and economic growth. This is reinforced by the recent findings of Heritage Foundation on economic freedom (2019 Index Economic Freedom, 2019) arguing that Rwanda is the most economically free SSA country with 32 ranking in the World and with 2\textsuperscript{nd} ranking in the SSA countries following Mauritius (the first), with 70.4\% in the trade freedom. In the overall, the positive developments in areas of business and trade openness have been shaped and conditioned by the policy and institutional framework in the country.

**Trade Openness and Other Macroeconomic Variables**

This section depicts the trends of trade openness with other and macroeconomic variables. As depicted in the figure 1 imports and Net-official development assistance to Rwanda have been leading other inflows for the last three decades. As shown in the figure the growth trends of exports and net-foreign direct investments were affected by the effects of genocide against Tutsi during 1994 and steeply picked-up right after the genocide until recent years. Similarly, like in other SSA countries, in Rwanda, Net-ODA still takes the lion’s share of external financial inflows, followed by exports, foreign direct investments and remittances. These trends depict Rwanda’s political and economic development trajectory in recent decades. The observed steep upward trends of Net-ODA indicate that the country still depends on external aids, though the trend is reducing. The upward growth trend of imports indicates that the country is still the net-importer despite huge strides to curb down the country’s balance of payment deficit. As depicted by sharp growth trend of export earnings right after the genocide until recent years. Another upward trend is observed in remittances and net-foreign direct investments (FDI), but the trend of remittance inflows depict steeper and reliant trend compared to the growth trend of net-foreign direct investments. Implying that, remittances remained resilient and steady despite the crisis of 1994 genocide and the economic shocks of the global financial crisis of the year 2008-2009. This is in line with the remittance and development discourse which argues that during a crisis (either security or economic instabilities), remittances tend to increase as an
alternative source of income for the affected recipients. They also increase when the economy is doing well, but in that situation is associated to the socio-economic reasons.

**Figure 1: The Growth Trends of Imports and External Inflows in Rwanda: 1980-2017**

![Graph showing growth trends of imports and external inflows in Rwanda from 1980 to 2017.](image)

**Source:** Author’s estimation based on (June 2019) time series data from World Bank Indicators
Figure 2: The Growth Trends of Trade Openness and External Inflows Percentage to GDP in Rwanda: 1980-2017

Source: Author’s estimation based on (June 2017) time series data from World Bank Indicators

The figure 2 depicts the growth trends of trade openness and other external inflows as percentage to GDP per capita in Rwanda for the period between 1980 and 2017. Evidently, these trends depict overall Rwanda’s economic trajectory before genocide and after genocide until recent years. Figure shows the falling and constant growth trends of all the variables during the period from 1980s to the genocide period and slightly after. And after genocide against Tutsi positive growth trends are observed. Though, the trend of trade openness has been moderate compared to other external inflows.

Results and Discussion

This section presents results and discussion of empirical findings related to the trade openness and economic growth in Rwanda. It starts with descriptive analysis of the studied variables and correlation of the variables. It proceeds with presentations of results of trade openness-growth impact using OLS and Johansen test of cointegration and the Error Correction Model (ECM).
Descriptive Analysis of Variables

Table two and three present descriptive analysis of the variables used in the empirical analysis. Accordingly, table 2 presents the summary statistics of the studied variables. That is; GDP per capita, remittance percentage to GDP, gross capital formation to GDP, Trade Openness, Foreign Direct Investments to GDP, Education and Domestic Credit to the Private Sector. It presents the mean, standard deviation (std), minimum and maximum observations and the total observations.

Table 2: Showing Summary Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std</th>
<th>Min</th>
<th>Max</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP per Capita</td>
<td>6.05</td>
<td>0.29</td>
<td>5.32</td>
<td>6.64</td>
<td>38</td>
</tr>
<tr>
<td>Rem%GDP</td>
<td>0.56</td>
<td>0.44</td>
<td>0.09</td>
<td>1.43</td>
<td>38</td>
</tr>
<tr>
<td>GCF%GP</td>
<td>2.87</td>
<td>0.23</td>
<td>2.40</td>
<td>3.29</td>
<td>38</td>
</tr>
<tr>
<td>OPEN</td>
<td>20.08</td>
<td>0.72</td>
<td>19.08</td>
<td>21.63</td>
<td>38</td>
</tr>
<tr>
<td>FDI%GDP</td>
<td>0.68</td>
<td>0.50</td>
<td>0.0002</td>
<td>1.68</td>
<td>38</td>
</tr>
<tr>
<td>Education</td>
<td>2.99</td>
<td>0.43</td>
<td>2.33</td>
<td>3.73</td>
<td>32</td>
</tr>
<tr>
<td>DCRPS%GDP</td>
<td>2.40</td>
<td>0.38</td>
<td>1.81</td>
<td>3.09</td>
<td>38</td>
</tr>
<tr>
<td>N</td>
<td>38</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: All other variables are transformed into logarithm

Table two presents the summary statistics of studied variables. Trade openness presents the highest average among all the variables while domestic credit to private sector as percentage of GDP presents the lowest mean. Most variables present the highest observations of 38 accept the variable for school enrolment which presents 32 observations.

Table 3: Pairwise Correlations Between Variables used in the Growth Equation

<table>
<thead>
<tr>
<th></th>
<th>GDP</th>
<th>FDI%GDP</th>
<th>Rem%GDP</th>
<th>GCF%GDP</th>
<th>Education</th>
<th>DCRPS%GDP</th>
<th>OPEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FDI%GDP</td>
<td>0.8899*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rem%GDP</td>
<td>0.5990*</td>
<td>0.6990*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GCF%GDP</td>
<td>0.9289*</td>
<td>0.8904*</td>
<td>0.6816*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>0.9292*</td>
<td>0.8385*</td>
<td>0.8513*</td>
<td>0.9173*</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DCRPS%GDP</td>
<td>0.7048*</td>
<td>0.6637*</td>
<td>0.7912*</td>
<td>0.7118*</td>
<td>0.7791*</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>OPEN</td>
<td>0.8420*</td>
<td>0.7519*</td>
<td>0.7672*</td>
<td>0.8120*</td>
<td>0.8437*</td>
<td>0.9349*</td>
<td>1</td>
</tr>
</tbody>
</table>

* p<0.05, ** p<0.01, *** p<0.001

Table three reports the correlation matrix of both dependent and main control variables. Stars signify significance at 1%, 5% and 10%. Number of observations: 38. Variables for: Real GDP per
capita, secondary enrollments as a percentage of total (as a proxy for education) and OPEN/TOT (trade openness), Rem% GDP, GCF% GDP, FDI% GDP represent remittance percentage to GDP, Gross capital formation to GDP and FDI percentage to GDP respectively all are in logarithms. Table two indicates the degree of comparison and level of significance of correlation as per every variable in the correlation matrix. It shows that all independent variables are correlated and are statistically significant to the dependent variable (GDP per capita) at 10 percent level of significance. Table 3 depicts a positive and statistically significant correlation between remittances inflows and real GDP per capita to Rwanda. The studied variables are based on the time series data from the World Bank indicators.

**Trade Openness and Economic Growth: Baseline Results of OLS**

The OLS model presents a baseline model examining the bi-direction impact of trade openness on economic growth. The study tests two hypothesis; First, trade openness positively influences economic growth. Second, the level of economic growth represented by lagged GDP per capita influence the rate of trade openness in Rwanda. Empirical tests of Model 1 and 2 were carried out in order to obtain a robust fit of data. Table 4 column 1 presents the estimation results of OLS as the benchmark model estimating the effect of trade openness on GDP per capita in Rwanda. I also estimate how economic growth (proxy by lagged GDP per capita) affects trade openness in Rwanda. The 0.953 value of the R-squared for the OLS results shows that 95.3% of variation in the real GDP per capita is explained by variation in the predictor variables used in the OLS model. The results are presented in the table here below.
Table 4: Results of OLS on the Effects of Trade Openness on the GDP per Capita

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(Model 1)</th>
<th>(Model 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lagged GDP per capita</td>
<td>0.423</td>
<td>0.423</td>
</tr>
<tr>
<td></td>
<td>(0.277)</td>
<td>(0.277)</td>
</tr>
<tr>
<td>Lagged GCF</td>
<td>0.142</td>
<td>-0.419*</td>
</tr>
<tr>
<td></td>
<td>(0.159)</td>
<td>(0.223)</td>
</tr>
<tr>
<td>Lagged Openness</td>
<td>0.290***</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(0.0873)</td>
<td>-</td>
</tr>
<tr>
<td>Lagged FDI</td>
<td>-0.0838***</td>
<td>0.0672</td>
</tr>
<tr>
<td></td>
<td>(0.0169)</td>
<td>(0.119)</td>
</tr>
<tr>
<td>Lagged Education</td>
<td>0.377***</td>
<td>-0.0497</td>
</tr>
<tr>
<td></td>
<td>(0.0764)</td>
<td>(0.108)</td>
</tr>
<tr>
<td>Lagged Remittances</td>
<td>0.129***</td>
<td>-0.167</td>
</tr>
<tr>
<td></td>
<td>(0.0263)</td>
<td>(0.157)</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.252</td>
<td>-2.851</td>
</tr>
<tr>
<td></td>
<td>-1.336</td>
<td>-2.201</td>
</tr>
<tr>
<td>Observations</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.953</td>
<td>0.985</td>
</tr>
</tbody>
</table>

* p<0.05, ** p<0.01, *** p<0.001

Table 4 presents two modes. The model one presents result of the first hypothesis, the effects of trade openness on GDP per capita, while model two presents results of the effects of the level of GDP per capita-lagged by one year on the trade openness. The lagged one year depict the level of development of the country. In the model the study examines whether the level of development statistically and significantly influence trade openness in Rwanda. As presented in Table 4 model 1, trade openness has positively and statistically significant effect on the economic growth in Rwanda -which confirms the first hypothesis of the model. Evidently, as depicted in the model one, one unit rise in trade openness affect GDP per capita by 29% statistically significantly at ten percent. While one-unit increase in the net FDI inflows affect negatively GDP per capita by 8.3% statistically significant at 10%. The lagged education and remittances have statistically significant effect on GDP per capita in Rwanda, while the lagged GCF have no significant effect on GDP per capita.
In the second model, I tease the data to examine whether the level of economic development (proxied by lagged GDP per capita) does influence trade openness in Rwanda. As depicted in the model two of table 4, there is no statistically significant effect (0.423) of the level of GDP per capita on trade openness. Implying that, trade openness could be driving economic growth rather than the latter-as revealed in the model one of table 4.

However, empirically, it is consistently claimed that OLS results are subjected to the endogeneity biases hence making OLS results unreliable to the empirical researchers. This study considers that empirical weakness of OLS. Accordingly, the results of OLS provide the baseline evidences about the impact of trade openness and economic growth in Rwanda. Having found statistically significant effect of trade openness on GDP per capita in Rwanda, the study extends the analysis to validate the findings by employing the cointegration test and error correction model techniques to examine the causal relationship between GDP per capita and trade openness, and the long-run relationship between trade openness and GDP per capita in Rwanda. The next section presents the results of the cointegration test, error correction model and Granger causality test.

**Trade Openness and Economic Growth: Results of Cointegration Test & ECM**

This section presents the results of; unit root tests, the Johansen test of cointegration and the error correction model related to the causal relationship between remittances and economic growth in Rwanda. Table 5 presents the results of the unit root of related variables, maximum lags selected.

**Table 5: Summary Results of Unit Root Tests**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Order of integration</th>
<th>P-Value</th>
<th>Test-Stat</th>
<th>5% Critical Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log(GDP per capita)</td>
<td>I(1)</td>
<td>0.000</td>
<td>-5.450</td>
<td>-1.694</td>
</tr>
<tr>
<td>FDI(% to GDP)</td>
<td>I(1)</td>
<td>0.000</td>
<td>-4.270</td>
<td>-1.694</td>
</tr>
<tr>
<td>Rem (% to GDP)</td>
<td>I(1)</td>
<td>0.000</td>
<td>-5.192</td>
<td>-1.694</td>
</tr>
<tr>
<td>Openness(% to GDP)</td>
<td>I(1)</td>
<td>0.001</td>
<td>-3.726</td>
<td>-1.694</td>
</tr>
<tr>
<td>GCF(% to GDP)</td>
<td>I(1)</td>
<td>0.000</td>
<td>-6.075</td>
<td>-1.694</td>
</tr>
<tr>
<td>Education (% Gross Sec)</td>
<td>I(2)</td>
<td>0.003</td>
<td>-3.383</td>
<td>-1.721</td>
</tr>
</tbody>
</table>
Augmented Dickey-Fuller (ADF) and Philips Peron (PP) tests were employed to estimate the stationarity of the variables of interest. Accordingly, the results in Table 5 indicate that the real GDP per capita, the percentage of: remittances, openness, FDI and GCF to GDP per capita are integrated at level I (1). That is, at first difference and their respective P-values are less than critical values (at 5% level of significance). Education and Credit to Private Sector, on the other hand, is non-stationary and gains stationarity after differentiation at second level. Therefore, the data are non-stationary time-series integrated at the order of one I(1) and I(2), see Table 5.

Figure 3: The Trends of Trade Openness and GDP per Capita

The figure three presents growth trends trade openness against GDP per capita in Rwanda for the period of study. Evidently, the two growth trends depict Rwanda development path over the last two decades. The period from year 1980 to around year 1993, the growth trend of Rwanda was insignificant- there was no observed growth. It even went worse during the
genocide against Tutsi represented by a dramatic drop by both variables. Right after the genocide, the two trends picked-up and increased steadily.

**Figure 4: Results of Impulse Response of Trade Openness and GDP per capita**

![Graph showing results of impulse response](image)

**Source:** Stata 15

As depicted in the figure four, on average, the growth trends of the two variables have been growing steadily and significantly. The results of impulse response indicate that, the present trends of trade openness are influenced by the previous trend of the two variables was low. I proceed to present the results of the lag selection here below- to be able to conduct cointegration test and ECM test.
Table 6: The Number of Lags Selected

Sample: 1980-2017
Number of Obs=25

<table>
<thead>
<tr>
<th>No of Lags</th>
<th>LL</th>
<th>LR</th>
<th>df</th>
<th>P</th>
<th>FPE</th>
<th>AIC</th>
<th>HQIC</th>
<th>SBIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>48.2439</td>
<td></td>
<td>4</td>
<td>0.000</td>
<td>0.009821</td>
<td>1.05247</td>
<td>1.08309</td>
<td>1.14225</td>
</tr>
<tr>
<td>1</td>
<td>244.799</td>
<td>128.27</td>
<td>4</td>
<td>0.018</td>
<td>0.000286</td>
<td>-2.48494</td>
<td>-2.39308</td>
<td>-2.21558*</td>
</tr>
<tr>
<td>2</td>
<td>54.2155</td>
<td>11.943*</td>
<td>4</td>
<td>0.018</td>
<td>0.000255*</td>
<td>-2.60091*</td>
<td>-2.44781*</td>
<td>-2.15198</td>
</tr>
<tr>
<td>3</td>
<td>57.5186</td>
<td>6.6063</td>
<td>4</td>
<td>0.158</td>
<td>0.000268</td>
<td>-2.55992</td>
<td>-2.34558</td>
<td>-1.93142</td>
</tr>
<tr>
<td>4</td>
<td>60.5546</td>
<td>6.0719</td>
<td>4</td>
<td>0.194</td>
<td>0.000288</td>
<td>-2.50321</td>
<td>-2.22764</td>
<td>-1.69514</td>
</tr>
</tbody>
</table>

Notes: Endogenous: Log GDP per capita and Openness (% to GDP). Exogenous: Education (% Gross Sec), GCF (% to GDP), Rem (% to GDP), FDI (% to GDP). LL= The log likelihood, LR= Likelihood-ratio, df=degree of freedom, P=probability, FPE= The final prediction error, AIC=Aikaike Information Criterion, HQIC=Hannan Information Criterion, BIC= Bayesian Information Criterion, SBIC: Schwarz Information Criterion. For further detail see (Mphumuzi Sukati, 2013)

The results of lag selection in table 6 choose lag two. The results in table 6 show that the LR, FPE, AIC, HQIC, SBIC choose maximum lags of two. This demonstrates that the bivariate model of trade openness and GDP per capita is explained by two lags. Then, I proceed to present the results of cointegration test here below. The results of the cointegration test are necessary prerequisites for the error correction model test.

Table 7: Results of Cointegration Test

<table>
<thead>
<tr>
<th>Trend: Constant</th>
<th>No of Observations: 36</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample:1981-2017</td>
<td>Lags: 2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Max Rank</th>
<th>Trace Stat</th>
<th>Critical Values (at 5%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>9.8950*</td>
<td>15.41</td>
</tr>
<tr>
<td>1</td>
<td>2.4988</td>
<td>3.76</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Max Rank</th>
<th>Max Statistic</th>
<th>Critical Value (at 5%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>7.3961</td>
<td>14.07</td>
</tr>
<tr>
<td>1</td>
<td>2.4988</td>
<td>3.76</td>
</tr>
</tbody>
</table>
The results of the Johansen test of cointegration double confirm existence of cointegration between trade openness and GDP per capita. Accordingly, evidence reveals that, there is a long-run relationship between trade openness and GDP per capita in Rwanda. In the model, when \( r=2 \), all variables in the model are stationary and the trace statistics is at \( r=0 \) of 9.8950* less than its critical value of 15.41, the null hypothesis of no cointegrating equations cannot be rejected. The trace statistics at \( r=1 \) of 2.498 is less than the critical value of 3.76; the null hypothesis cannot be rejected that there is one cointegration relationship between GDP per capita and Trade Openness in Rwanda. The results indicate that both the trace test and maximum eigenvalue test in the johansen test each detect cointegrating vectors, thus, the null hypothesis is accepted at 5% level of significance, confirming a cointegrating relationship between the two variables. Implying that, the variables of trade openness and GDP per capita have a significant positive long-run relationship between the two variables. With these results, table 8 here below presents the results of ECM model.

**Table 8: Showing the Results of Vector Error Correction Model, VECM**

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vec</td>
<td></td>
</tr>
<tr>
<td>Error correction term</td>
<td>-0.396***</td>
<td>0.0934**</td>
</tr>
<tr>
<td>( (L._{ce1}) )</td>
<td>(0.131)</td>
<td>(0.133)</td>
</tr>
<tr>
<td>Lagged D. LogGDP</td>
<td>-0.0278</td>
<td>0.710***</td>
</tr>
<tr>
<td>( (0.165) )</td>
<td>(0.168)</td>
<td></td>
</tr>
<tr>
<td>Lagged D. LogOpenness</td>
<td>0.0131</td>
<td>0.160</td>
</tr>
<tr>
<td>( (0.147) )</td>
<td>(0.149)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.0105</td>
<td>0.0447**</td>
</tr>
<tr>
<td>( (0.0215) )</td>
<td>(0.0219)</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>36</td>
<td>36</td>
</tr>
</tbody>
</table>

*Notes: Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1; No of Obs: 36*
Table 8 presents the results of the VECM. The overall results of the model fit well. The results in Table 8 indicate that the direction of long-run causality runs from trade openness to GDP per capita in Rwanda. The value of $\beta_1$ is 0.0934** and it is significant at the 5% level. This value represents the short-run coefficient and short-run equilibrium. This means that the system will correct its previous period disequilibrium at a speed of 9.34% between trade openness and GDP per capita. For the long-run equilibrium, on the other hand, the coefficient of error correction term is negative (-0.396*** and it is significant at the 5% level, indicating the rate at which the system corrects the previous period disequilibrium of the system. This implies that the system corrects its previous period disequilibrium at a speed of 39.6% annually. The results imply that economic growth in Rwanda changes significantly in the short equilibrium influenced by changes in the trade openness.

Table 9: Showing the Results of Serial Correlation on the Long-Run Causality between GDP per capita and Trade Trade Openness

<table>
<thead>
<tr>
<th>No of Lags</th>
<th>Chi2</th>
<th>df</th>
<th>Prob&gt;Chi2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6.5350</td>
<td>4</td>
<td>0.16260</td>
</tr>
<tr>
<td>2</td>
<td>9.3819</td>
<td>4</td>
<td>0.05223</td>
</tr>
</tbody>
</table>

*Ho: No autocorrelation at lag order*

Table 9 presents the results of serial correlation on the long-run causality between trade openness and GDP per capita. The results of serial correlation on the long-run causality indicate no autocorrelation among trade openness and GDP per capita (the null hypothesis). The p-value is not significant (0.1626), thus accepting the null hypothesis. The test of normality distribution of residuals safely indicates that the residuals are normally distributed.

Table 10: Results of Normality Test for Distribution of Residuals using Jarque-Bera
Table 10 here presents the results of the normality test for distribution of residuals using the Jarque-Bera test. Accordingly, the results of normality test for distribution of residuals show that the p-value of the dependent value and for the overall model is significant. Therefore, the null hypothesis is rejected, confirming that the residuals of the model are normally distributed.

4.4 Granger Causality Test Results
In this section, I examine causality relationship between trade openness and economic growth in Rwanda based on the hypothesis of no existing causality between the two variables. The results in the table 11 reveal unidirectional causality between trade openness and GDP per capita (TOT→ GDP). This implies that the null hypothesis is rejected of no existing causality between the two variables. That is, there is unidirectional causality running from trade openness to economic growth in Rwanda at statistically significant level at 5% significance.

Table 11: Granger Causality Test Results

<table>
<thead>
<tr>
<th>Pairwise Granger Causality Tests</th>
<th>Obs</th>
<th>df</th>
<th>F-Statistic</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>Null Hypothesis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOT does not Granger Cause GDP</td>
<td>31</td>
<td>2</td>
<td>51.584</td>
<td>0.0116***</td>
</tr>
<tr>
<td>GDP does not Granger Cause TOT</td>
<td>31</td>
<td>2</td>
<td>51.584</td>
<td>0.4302</td>
</tr>
</tbody>
</table>

*Ho: No autocorrelation at lag order

Conclusion
This study contributes to the ongoing mixed theoretical and empirical narratives about the development effect of trade openness in developing countries. It examines the contribution of trade openness on the economic growth in Rwanda for the period between 1980 and 2017. Specifically, this study examines 1) the trends of trade openness and economic growth; 2) the
short run and the long-run relationship between trade openness and economic growth; 3) investigates whether trade openness granger causes economic growth in Rwanda.

This study addresses the causal mechanism between trade openness and economic growth, with particular focus on the country context. The study finds that country policy and institutional environment conditionally influence the growth-driven trade openness. That is, the presence of good policies and institutions influence positively the growth effect of trade openness in developing countries such as Rwanda. Indeed, the descriptive analysis point to the fact that, the positive growth trends of trade openness are evident right after the genocide against Tutsi, contrary to the prior years when the country was experiencing political instabilities and weak policy and institutional framework. Which the country gained political stability, put in place institutions and trade driven policies, local and international trade started picking-up, and the impact of trade openness on economic growth started to be evident.

The study considered the methodological issues affecting empirical analysis related to the trade openness and economic growth and employed possible and credible econometric techniques to address the problem of causality.

The analytical framework of this study is embedded in the theoretical and empirical debate between three dominant theoretical approaches about trade openness and economic growth: the Ricardian-Hecksher-Ohlin trade Theory, Endogenous Growth Theories and the Absolute Advantage Theory. The study finds that the three theories are complementary and mutually exclusive in explaining the relationship between international trade and economic development. They provide framework (such as endogenous growth theories) through which empirical studies examine the growth impact of trade openness. However, they remain shallow to explain institutional and contextual factors that condition the way trade openness influence economic growth and development. More so, the three theories are unable to explain the nature and the direction of causality between trade openness and economic growth.

The findings of study reveal a positive and statistically significantly impact of trade openness on economic growth in Rwanda. There is unidirectional causality running from trade openness to the economic growth (proxy of GDP per capita) in Rwanda, but not vice versa. The OLS results
show that, one unit increase in trade openness affect GDP per capita by 29% in Rwanda, while the growth effect on trade openness is not statistically significant. The results of the Johansen test of cointegration double confirm the existence of cointegration between trade openness and GDP per capita. Implying that, there is a long-run relationship between trade openness and GDP per capita in Rwanda.

The results of ECM reveal that the direction of long-run causality runs from trade openness to GDP per capita in Rwanda. The value of error correction term ($\beta_1$) is 0.0934** and it is significant at the 5% level and represents the short-run short-run equilibrium effect. Implying that, the system will correct its previous period disequilibrium at a speed of 9.34% between trade openness to GDP per capita. For the long-run equilibrium, on the other hand, the coefficient of error correction term is negative (-0.396***) and it is statistically significant at the 5% level, indicating the rate at which the system corrects the previous period disequilibrium of the system. This implies that the system corrects its previous period disequilibrium at a speed of 39.6% annually. The results imply that economic growth in Rwanda changes significantly in the short equilibrium influenced by changes in the trade openness.

The results of granger causality double confirm the long-run causality between trade openness and economic growth in Rwanda. Similarly, findings reveal plausible evidence of a long-run relationship between remittances and GDP per capita. The unidirectional long-run causality runs from trade openness to GDP per capita in Rwanda, but not vice versa. Therefore, trade openness impact economic growth in Rwanda, not vice versa.

**Policy Implications**

The findings of this study reveal that trade openness positively impact economic growth in Rwanda. And the growth trends of trade components-mostly exports and trade openness and GDP per capita in Rwanda have been growing lineally over the last two decades in Rwanda. Trade openness affect economic growth by increasing Rwanda’s foreign earnings and trade competitiveness locally and internationally. The evidence from this study suggests that the institutional and policy framework are equally important in causally conditioning the overall growth impact trade openness in Rwanda. This means that, policies and institutional
effectiveness matter in influencing the growth and development impact of opening up in
developing countries such as SSA countries. The analysis of this study suggests the following
policy implications in order to maximize the growth impact of trade openness in SSA countries
and Rwanda in particular.

Firstly, in order to sustain future economic growth under the static and dynamic gains from
multilateral and region trade agreements, Rwanda should diversify its export commodities and
develop greater social and economic cooperation with the rest of the world. Rwanda needs to
facilitate trade in both extensive margin (new products or new markets) and intensive margin.
However, export expansion through both extensive margin and intensive margin should equally
be promoted and supported.

Secondly, the study recommends the diversification of export commodities, increasing gross
fixed capital formation and improving terms of trade and considering all export promotion
strategies geared to increase Rwanda’s trade competitiveness by strengthening backward and
forward linkages for trade value chains.

Thirdly, low export growth in Rwanda implies that there are real constraints to trade between
Rwanda and the regional economies that need to be addressed. The issue of tariff and non-
tariff barriers to trade is an example that needs to be addressed in order to facilitate trade, but
also continues to liberalize financial sector as a key sector facilitating international trade of
goods and services in Rwanda.

Finally, in the era of growing globalization and trade liberalization, the importance of exports in
the economic growth of Rwanda cannot be overemphasized. Rwanda therefore undoubtedly
needs to become competitive to be able to curve a niche in the world market and realize its
long term goals of sustainable economic growth and development as stipulated in the National
Strategy for Transformation.

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Rwanda Economic Update • Edition No. 10

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