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International Trade and Economic Misery in African Countries with Low Human Development

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Abstract

Puzzled by the demeaning level of poverty most African countries continue to grapple with despite their extensive participation in international trade, the study attempts to examine the encumbrances that tend to impede African countries from optimally reaping the developmental gains inherent in partaking in international trade, which seems to also worsen the economic misery the inhabitants endlessly contend with. The System Generalized Method of Moments (System-GMM) estimation technique was used in the study which involves 17 African countries and spans from 1995 - 2018. While misery index is used to measure economic misery, the impact of international trade on economic misery is captured by means of its effect via economic misery, economic growth rate, balance of payment, total export, manufacture export and exchange rate. The results of the study reveal that balance of payments, total export, manufacture export, per capita GDP growth rate, exchange rate and lagged form of economic misery all have positive effect on economic misery. While the effects of total export, manufacture export, per capita GDP growth rate, and exchange rate on economic misery are significant, those of balance of payments and lagged form of economic misery are insignificant. While the study recommends that international trade be engaged strategically such that it results in favorable balance of payments, it also encourages the discarding of obsolete trade policies such as outright bans on importation of certain commodities. Bilateral trade agreements are recommended over multilateral trade agreements, since they are more mutually beneficial and binding on the parties involved.

Keywords: International trade, Development, Economic misery, Africa

JEL Classification: F10, I31, I32, O55

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1. Introduction

The notion that international trade brings about economic gains is seldom disputed. It is this gain that some trade theories refer to when they describe the disposition of countries who engage in international trade as being 'better off.' Interestingly, the gains that come with engaging in international trade have never been suggested by any trade theory as being distributed equitably between or among the trading countries. Thus, it could be argued that while international trade makes some countries better off, it tends to make some others worse off or maybe not as better off as the other country. That a country becomes worse off by

engaging in trade with other countries may sound incredible, but a closer look at the growth and development indicators of some countries could fizzle out any doubt (Thirlwall, 2000).

The purported inability of international trade to bring about economic growth and development in some countries might stem from the difficulty involved in exporting goods to some countries; it could also be the manner in which these transactions are carried out. These connote the existence of protectionism tendencies which are exhibited through tariff and non-tariff barriers or outright ban of certain commodities. Other factors that could serve as impediments for international trade to amount to economic growth and development could also include the existence or absence of bilateral and/ or multilateral trade agreements, low productive capacity or the inability to decipher that increase in international trade does not necessarily amount to increase in export, which informs a country on how to effectively determine the outcome of trade such that it nudges it on the path of economic development.

Having export goods which largely comprise of primary goods suggests that the export earnings of many African countries are irregular, since they are more vulnerable to the vagaries of the international market. Furthermore, these goods also have very low income and price elasticities, implying that increases in income of consumers or decreases in prices of the export commodities rarely bring about increases in their demand. However, decreases in the prices of these commodities bring about decreases in the earnings of government and individuals whose sources of livelihood depend on the export of these commodities, with their attendant impact on the standard of living of the citizenry (Ezenekwe, Umeghalu & Uzodigwe, 2018).

Another trait exhibited by these countries that is occasioned by their heavy reliance on one or two primary commodities is the “Dutch Disease Syndrome.” The Dutch disease model explains the causal relationship between the increase in economic activity of a specific sector, (usually the exploitation of natural resources) and the decline in economic activities in the other sectors (usually the manufacturing and agricultural sectors). They are of the position that it results from the revenue increases in the growing sector which leads to the appreciation of the domestic currency which then makes export commodities of the other sectors to become more expensive and inadvertently less competitive (Corden, 1984).

It is in attempts to sort out some of the afore mentioned factors that supposedly hinder developing countries from reaping optimal benefits inherent in international trade and more specifically the perceived trade barriers among African countries that the African Continental Free Trade Area (AfCFTA) was conceptualized. AfCFTA is the African Continent’s ambitious integration initiative embedded in the African Union’s Agenda 2063. AfCFTA’s main objective is to create a single continental market for goods and services with free movement of people and investments, thus expanding intra-African trade across the continent, enhancing competitiveness and supporting economic transformation in Africa. The AfCFTA is expected to increase intra-Africa trade from an existing level of about 13% to 25% or more through better harmonization and coordination of trade liberalization (European Union, 2019). Interestingly, international trades between African countries and the rest of the world have peculiar trends. Africa’s share of global trade put at 2.4% as at 2015, this tends to be too negligible for a continent with about 20% of the world’s population, even though it accounts for only 3% of the global GDP. Furthermore, a substantial percentage of the commodities exported by African countries are primary commodities while the volume of trade amongst African countries is astonishingly low, put at 14% as at 2018 (Verter, 2017; Coleman, 2020).

Most African countries have countries outside their continent as their largest trading partners, an occurrence that is inconsistent to the ‘gravity trade theory.’ Table 1 below shows select African countries with their largest trading partners and the value of trade with these partners as a proportion of total trade.

Establishing a Free Trade Area (FTA) is not far from being a laudable initiative, but is it capable of improving the living standard of the citizenry of participating countries? Highlighting the disparity between a free trade area and a free trade zone stands to give an idea of what AfCFTA portends for the member countries. A free trade area is a region in which a group of countries have signed a free trade agreement and maintains little or no barriers to trade in the form of tariffs or quotas among each other. On the other hand, a free trade zone is a designated location in a geographical area where enterprises can operate without trade barriers, bureaucratic bottlenecks and custom interference in order to attract new businesses and foreign participation. It is an industrial trade promotion instrument established to help reduce unemployment and generate foreign exchange earnings, and serves as engines for industrialization and economic growth by attracting foreign direct investments. From the foregoing, establishing a free trade area implies people and goods having unhindered access to the markets of member states, marginal increase in trade among members and total or partial removal of tariffs, quotas and other barriers to international trade. On the other hand, it also implies reduction in revenue accruals from import duties and related taxes on import and export goods.

Table 1: The Main import and export partners of select African countries.

Country	Largest Partner (%)	Import	Largest Export Partner (%)
Nigeria	China (28%)		India (18%)
Cameroon	China (19%)		Netherlands (15.6%)
Ghana	China (16.8%)		India (23.8%)
South Africa	China (18.0%)		China (9.9%)
Egypt	China (7.9%)		United Arab Emirates (10.9%)
Kenya	China (22.5%)		Uganda (10.8%)
Ethiopia	China (24.1%)		Sudan (23.3%)
Senegal	France (16.3%)		Mali (14.8%)
Uganda	China (17.4%)		Kenya (17.7%)
Angola	Portugal (17.8%)		China (61.2%)

Source: CIA World Factbook, 2019

With the major goal of partially or utterly removing trade barriers in an effort to increase the volume of trade amongst African countries, the AfCFTA initiative might not be the much sought after restorative policy that would ameliorate Africa’s development challenges through international trade. This is partly because primary commodities have low price and income elasticities, and since more than 50 percent of the total exports of most African countries are comprised of primary goods, the AfCFTA initiative will most likely bring about only a little increase in total export. This will invariably stimulate only a marginal increase in economic growth and development, unless the initiative is accompanied with efforts directed towards

diversifying the goods the export baskets of the participating countries are comprised of and improving the stability of the exchange rates of the participating countries.

The relatively low trade volume among African countries is not necessarily due to the existence of tariff and non-tariff trade barriers alone. The low productive capacities and poor quality of goods produced by many African countries which are directly or indirectly traceable to lack of social infrastructure, low technical know-how and poor entrepreneurial ability are also sources of concern. Aside from being largely unable to compete effectively with products manufactured in technologically more advanced countries in terms of quality and price, a considerable proportion of commodities produced in Africa are manufactured by producers who operate in the informal sector of these economies. Hence, many of their activities are carried out through crude methods, in obscurity and by persons who just want to get by, instead of having the ambition of becoming notable global players. Table 1 shows that most African countries have China as the country from which most of their imports come from and there is no sufficient evidence that trade barrier is the reason for such occurrences.

The perception that the potential gain derivable from the external sector of an economy and the attendant improvement in the economic development of a country accrues only through its impact on economic growth does not seem utterly true. The proceeds of international transactions tend to have direct bearings on economic development. Balance of payments over time determines the exchange rate value of a country's currency which in turn affects the rate of inflation and the purchasing power of its currency. A country's balance of trade largely determines its balance of payments since it accounts for a substantial proportion of a country's total economic activity. The balance of payments of a country affects its exchange rate; furthermore, exchange fluctuations affect the purchasing power of a country's currency which to a large extent affects the standard of living of the citizenry. While an increase in purchasing power due to the appreciation of domestic currency could improve standard of living, a decrease in purchasing power due to the depreciation of domestic currency could in a similar vein exacerbate economic misery.

It has been argued that international trade is an important catalyst of economic development, however, the suspicion that it has not engendered economic growth and development in some climes makes it a puzzle that has aroused the interest of a number of scholars. Studies have shown that the importance of international trade to every economy is enormous; it does not only afford the citizens of a country means of livelihood, it also provides foreign exchange earnings for countries and empowers them to effectively manage their monetary and fiscal positions effectively. International trade holds the potentials of bringing about improvement in the living standard of the average man, especially those who are directly or indirectly employed in industries and sectors that produce export goods or deal on imported goods (Kalaitzi & Chamberlain, 2020; Oreiro & Silva, 2019; Zohonogo, 2016).

Notwithstanding the fact that most African countries actively engage in international trade for decades, a majority of its populace continue to grapple with poverty in its most debilitating level. Seychelles is the only African country that is ranked among countries with very high Human Development Index (HDI). While only Libya, South Africa, Gabon, Egypt, Botswana, Tunisia, Algeria and Mauritius are ranked as having high HDI, other African countries belong to the categories of countries with low and medium HDI (See Table 2). If Africa's trade with the rest of the world has not brought about visible improvement in their economic development, is it the improved trade relations amongst just African countries that will do so?

Table 2. Human Development Index (HDI) and Manufacture Export as a proportion of Merchandise Export in Selected African Countries

Country	Year	1995	2000	2005	2010	2015	2018
Nigeria	HDI	0.432	0.445	0.466	0.482	0.520	0.534
	MFX as % MD Exp	1.002161	0.206996	1.768423	6.685777	3.382166	
Cameroon	HDI	0.442	0.438	0.455	0.471	0.548	0.563
	MFX as % MD Exp	7.917894	3.26108	2.840368	7.536951	8.90384	
Cote d'Ivoire	HDI	0.399	0.407	0.431	0.454	0.494	0.516
	MFX as % MD Exp	6.568391	14.47951	18.71063	16.17189	8.106354	
Ghana	HDI	0.469	0.483	0.519	0.554	0.585	0.596
	MFX as % MD Exp	13.16826	14.62174	32.52972	20.68046	15.71943	
Morocco	HDI	0.500	0.531	0.575	0.618	0.660	0.676
	MFX as % MD Exp	51.40239	64.09312	65.79775	66.32246	69.41845	
Zambia	HDI	0.426	0.438	0.480	0.531	0.570	0.591
	MFX as % MD Exp	6.95219	10.73806	8.764034	6.287581	10.05394	
Uganda	HDI	0.354	0.395	0.442	0.489	0.515	0.528
	MFX as % MD Exp	4.390541	3.108751	11.53509	22.84898	24.63931	
Malawi	HDI	0.333	0.362	0.400	0.437	0.475	0.485
	MFX as % MD Exp	7.344854	7.446085	16.27378	8.958683	15.35641	
Kenya	HDI	0.457	0.446	0.490	0.533	0.562	0.579
	MFX as % MD Exp	27.57109	20.77722	31.90692	34.66569	37.88727	
Rwanda	HDI	0.291	0.337	0.413	0.488	0.515	0.536
	MFX as % MD Exp	12.13915	2.738639	3.557374	8.450775	15.44185	
Ethiopia	HDI	0.	0.283	0.348	0.412	0.453	0.470
	MFX as % MD Exp	11.17065	9.777657	4.58148	8.906119	7.330661	
Zimbabwe	HDI	0.475	0.452	0.462	0.472	0.543	0.563
	MFX as % MD Exp	37.11155	26.90844	38.09668	36.42387	16.78748	
Tanzania	HDI	0.384	0.395	0.441	0.487	0.519	0.528
	MFX as % MD Exp	16.84617	19.63217	14.03759	24.06316	26.09708	
Senegal	HDI	0.384	0.390	0.429	0.468	0.504	0.514
	MFX as % MD Exp	48.13864	26.93586	43.42338	41.66855	31.8136	
Congo Republic	HDI	0.355	0.333	0.375	0.416	0.445	0.459
	MFX as % MD Exp	2.70953			30.47747		
Mozambique	HDI	0.259	0.301	0.349	0.396	0.428	0.446
	MFX as % MD Exp	13.39136	6.66755	6.504783	1.974486	8.417639	
Central African Republic	HDI	0.330	0.325	0.345	0.365	0.375	0.395
	MFX as % MD Exp	44.76777	68.24544	37.81693	3.154932	76.13562	

Source: World Development Indicators, 2019.

Studies have shown that international trade spurs economic growth and development, that it has not been the case for many African countries should suggest that a country does not become better off by merely engaging in international trade, it rather does if international trade is carried out strategically; what then does carrying out international trade strategically entail?

Asking why countries that engage in international trade continue to grapple with poverty gives the impression that international trade is about the only factor that instigates growth and development. Interestingly, studies have shown that trade is indeed one of the major factors driving national average incomes (GDP per capita) and macroeconomic productivity (GDP per worker) over the long-run; more specifically, as at the 1870s, the sum of worldwide exports accounted for less than 10% of global output, while it got close to about 25% in recent years. This indicates a more than proportional growth in global trade in about a century (Ortiz-Ospina, Beltekian, & Roser, 2018). The international trade structure and the composition of export goods of many African countries somewhat give a glimpse of why the continent's involvement in international trade has not ameliorated its economic development challenges. Many countries in Africa rely on very few export commodities which are in most cases primary commodities usually exported with little or no value addition (Lopez, 2017; Oreiro & Silva, 2019).

A substantial proportion of the goods exported by most African countries are of the primary sector extraction; manufacture export is relatively very low. The manufacturing sectors of most African economies continue to wallow in endless struggle in their efforts to effectively compete with rival firms outside the continent in the international market. This scenario has been attributed to the existing poor infrastructures and acute shortage of skilled manpower in these countries. However, these reasons do not explain why some industries that used to function effectively are now moribund, nor do they clarify why Africa's manufacture export as a percentage of global manufacture export is not only negligible but has plummeted over the years (World Bank, 2019). Manufacture exports play important roles in making international trade and the external sector in its entirety bring about economic development. While primary commodities largely have very low price and income elasticities, manufacture commodities on the other hand have high price and income elasticities, indicating that decrease in price is usually followed by increase in demand while increase in income also spurs increase in demand.

The above observed disparity between primary product export and manufacture export hints that the African Continental Free Trade Area (AfCFTA) initiative might not be the panacea desired in the efforts to make international trade more development oriented in Africa, since the AfCFTA initiative is just an aspect of a broader development plan, the African Union's 'Agenda 2063'. The highlighted difference also comes very close to providing convincing explanation to the low economic development impact of international trade in Africa, and in that light tends to deliver the narrative of the process that leads to the emergence of the Dutch disease, particularly how it arm-twists a potentially development spurring process into being the opposite. However, it has been observed that Dutch disease does not result from unfavourable trade outcomes alone; studies have shown that foreign investments, remittances and foreign aids also bring about the Dutch disease (Fielding & Gibson, 2011; Andrade and Duarte, 2017; Lopez, 2017). Instructively, all the economic variables that studies have shown to bring about the Dutch disease do so through the impact they exert on the exchange rate. However, while Dutch disease is said to bring about appreciation of the exchange rate,

available data show that African countries exhibit the very opposite (See Table3). This depicts that unfavourable trade balances and unhealthy balance of payments might ‘also be part of the reasons why international trade drags in enhancing economic development in Africa, and not just Dutch disease, due to their effects on the exchange rate (World Bank, 2019).

table 3. Current Account Balance and Official Exchange Rate of Selected African Countries

Country	Year	1995	2000	2005	2010	2015	2018
Nigeria	Exchange Rate	21.9	101.7	131.3	150.3	192.4	306.1
	BoP (\$ bls)	-2.578	7.427	36.529	13.111	-15.763	8.499
Cameroon	Exchange Rate	499.1	712.0	527.5	495.3	591.5	555.7
	BoP (\$ bls)	-0.09	-0.333	-0.565	-0.650	-1.174	-1.555
Cote d'Ivoire	Exchange Rate	499.1	712.0	527.5	495.3	591.5	555.7
	BoP (\$ bls)	-0.492	-0.241	0.04	0.465	-0.201	-1.459
Ghana	Exchange Rate	0.1	0.5	0.9	01.4	3.7	4.6
	BoP (\$ bls)	-0.32	-0.483	-1.219	-2.770	-2.836	-2.075
Morocco	Exchange Rate	8.5	10.6	8.9	8.4	9.8	10.7
	BoP (\$ bls)	-1.186	1.434	-0.101	-4.078	-2.165	-5.317
Zambia	Exchange Rate	0.9	3.1	4.5	4.8	8.6	10.5
	BoP (\$ bls)	-0.145	-0.438	-0.232	-1.525	-0.831	-1.260
Uganda	Exchange Rate	969.0	1644.5	1780.5	2177.6	3240.7	3727.1
	BoP (\$ bls)	-0.281	-0.359	0.049	-1.610	1.675	-1.913
Malawi	Exchange Rate	15.3	59.5	118.4	150.5	499.6	732.3
	BoP (\$ bls)	-0.078	-0.073	-0.486	-0.597	-0.572	-0.638
Kenya	Exchange Rate	51.4	76.2	75.6	79.2	98.18	101.30
	BoP (\$ bls)	-0.283	-0.199	-0.275	-2.369	-4.289	-4.801
Rwanda	Exchange Rate	262.2	389.7	557.8	583.1	721.0	861.09
	BoP (\$ bls)	0.057	-0.094	-0.065	-0.414	-1.106	-0.738
Ethiopia	Exchange Rate	6.2	8.2	8.7	14.4	20.6	27.43
	BoP (\$ bls)	0.039	0.013	-1.568	-0.425	-6.579	-5.253
Zimbabwe	Exchange Rate	0.01	0.04	22.4	1	1	1
	BoP (\$ bls)	-0.369	0.322	-0.087	-1.444	-1.521	-1.035
Tanzania	Exchange Rate	574.8	800.4	1128.9	1395.6	1991.4	2263.8
	BoP (\$ bls)	-0.59	-0.472	-0.938	-2.385	-3.846	-2.141
Senegal	Exchange Rate	499.1	712.0	527.5	495.3	591.5	555.7
	BoP (\$ bls)	-0.323	-0.328	-0.678	-0.568	-1.004	-1.731
Congo Republic	Exchange Rate	499.1	712.0	527.5	495.3	591.5	555.7
	BoP (\$ bls)	0.015	0.086	-0.389	-2.174	-1.433	-0.208
Mozambique	Exchange Rate	9.0	15.2	23.0	34.0	47.0	61.6
	BoP (\$ bls)	-0.464	-0.697	-0.761	-1.679	-5.968	-4.96

Source: World Development Indicators, 2019

Regardless of the existence of Dutch disease or not, the structural dispositions of many African countries suggest that they are inclined to be infected by Dutch disease, if they are not already infected. Only Senegal, South Africa, Egypt, Morocco and a few other African countries have total manufacture exports as percentage of total merchandise export of 40 per cent and above. Most African countries have revenue proceeds from export of primary commodities that consist of more than 50 percent of government's total revenue, while only a

handful of these countries have tax revenues as percentages of total government revenues of more 50 per cent. The existence of Dutch disease or export earnings that are fraught with fluctuations due to the volatility that characterize commodity prices in the international market clearly indicates that African countries do not strategically engage in international trade in manners that spur economic development or mitigate economic misery (World Bank, 2018).

Dutch disease tends to share a very close relationship with “vicious circle of poverty.” While Dutch disease seems to be the modus through which the circle of misery comes to fruition, the ‘vicious circle of poverty’ seems to perpetuate it. Put succinctly, international trade either improves economic development or exacerbates poverty. When balance of trade is favourable, more opportunities are created and the economy experiences the stability that engenders economic growth and development. Favourable balance of payments afford a country the opportunity to increase real income by increasing nominal income, and the leverage to diversify the economy since certain industries can thrive only under specified minimum average income and sustainable policies.

The study broadly attempts to determine if international trade undermines economic development efforts in Africa. This objective is premised on the view that many African economies are besieged by or wont to be susceptible to the Dutch disease, since the massive export of one or two primary commodities supposedly brings about drastic appreciation of the domestic currency which then makes manufacture exports of the countries in question to become less competitive in the international market. More specifically, the study seeks to evaluate the impact of international trade on economic development in Africa, taking into consideration the contribution of manufacture export, balance of payments and exchange rate in this regard. It promises to bring to the fore how international trade has fared in contributing towards economic development in Africa, the potentials it holds in this respect as posited by Friedrich List (1789 - 1846) in his ‘National Economics’ theory and the need for bilateral and multilateral trade agreements.

The study covers the period between 1995 – 2018, a time interval within which the economies of most African countries cannot be said to still have sectors that largely follow protocols established during colonial rule or still grapple with the over bearing influence of external forces. It involves 17 African countries which exhibit at least one of the three cardinal effects of Dutch disease and have low manufacture exports; they are selected from all the regions in Africa. More specifically, the select countries have the following features: (i) They have more than 50 per cent of their export earnings sourced from the export of one or two primary commodities. (ii) The value of their manufacture export as percentage of the value of total export is less than 25 per cent. (iii) They have average HDI of 5.5 or less over the period of the study.

Are African countries plagued by the “Dutch Disease?”

“Dutch disease” could simply be described as the reduction in a country’s export performance as a result of appreciation of its exchange rate traceable to the discovery of a natural resource such as oil. Dutch disease is believed to be a scourge that is common among resource rich countries. It has its origin from the Netherland’s experience following the country’s discovery and exploitation of vast natural gas reserves in the 1960s. This led to the concentration of economic activities in the gas industry, leading to massive production and exportation of gas

and attendant appreciation in the value of the country's currency and increase in the prices of non-tradable goods and services, thereby hurting the export of most tradable goods (Corden & Neary, 1982).

From the literature, the evidence of the existence of Dutch disease in a particular country is categorized into three cardinal effects: the resource movement effect, the spending effect, and the exchange rate effect. The resource movement effect stems from the supply side of the economy wherein the booming natural resource sector attracts productive resources from the other sectors, which results in the decrease of the productive capacity and output of these other sectors. On the other hand, the spending effect occurs on the demand side of the economy; it results from the excessive revenue accruals from the natural resource sector. This leads to increased income, which invariably brings about sharp increase in demand for goods in the other sectors of the economy, and thus instigating rise in the rate of inflation. This makes export goods from the other sectors less competitive in the international market. The exchange rate effect results from the huge foreign exchange inflow derived from natural resource export. And with the increase in foreign exchange inflow comes increase in the demand of the domestic currency of the natural resource rich country, which brings about appreciable appreciation in the value of the domestic currency and thereby making tradable goods relatively more expensive and less competitive both domestically and in the international market (Corden, 1984).

The intricacies of economic activities that could lead a country to be plagued by the Dutch disease could initially and partly emanate from the outcome of its international trade on natural resources; this indicates that there are other economic factors that could spur economic anomalies with symptoms like those exuded by a Dutch disease infected country. The unhealthy impact of natural resources sales in the international market on an economy that brings about Dutch disease occurs via its effect on exchange rate. In that light, other economic activities that could bring about appreciable increase in the exchange rate value of a country like increase in foreign investment, foreign aid and remittances could also bring about economic conditions similar to those of Dutch disease. Consequently, since Dutch disease is largely an exchange rate issue, it could also be caused by other factors that could instigate sharp increases in the exchange rate value of a country (Rajan & Subramanian, 2009; Acosta & Mandelman, 2009)

Studies have shown that foreign aid affects the growth of the manufacturing sector. Aid flows is believed to have systematic adverse effect on a country's competitiveness as reflected in the lower relative growth rate of exportable industry goods of 47 significant aid receiving low income countries in the study carried out by Rajan and Subramanian (2009). The work of Fielding and Gibson (2011) in which they found that aid inflow causes a real exchange rate appreciation in many aids receiving countries also corroborates this view. Remittances are also believed to cause Dutch disease. Acosta and Mandelman (2009) found that an increase in remittances flows lead to a decline in labour supply and an increase in consumption demand that is biased towards non-tradables, since higher non-tradable prices serve as incentives for expansion of that sector, culminating into reallocation of labour away from the tradable sector. The work of Eromenko (2016) also supports this view. In his study wherein he tested whether the large inflow of foreign exchange coming into Kyrgyzstan and Tajikistan from labour migrants does cause Dutch disease. He was able to trace evidence of deindustrialization to the strong appreciation of their local currencies during high oil prices, indicating transfer of Dutch disease from resource rich Russia.

Even though it is not popular among scholars, foreign investment is also considered as one of the means through which a country could contract the Dutch disease. Botta, Godin and Missaglia (2015) tried to establish that there is a relationship between FDI in Columbia's mining sector and exchange rate appreciation in the country, indicating that FDI inflows could spur the manifestation of Dutch disease. The study of Lartey (2007) also corroborates the view of the trio above. Lartey (2007) tried to investigate the question of whether capital inflows, particularly FDI cause the real exchange rate to appreciate. The results of the study show that FDI causes real exchange rate to appreciate.

Interestingly, there are economies that could be described as being besieged by the Dutch disease but exhibit only two out of three major traits associated with the Dutch disease. More specifically, there are a number of countries, mostly low income countries that exhibit the resource movement and spending effects of the Dutch disease while the exchange rate effect is manifested in a reverse order. This implies that instead of the noticeable appreciation of the domestic currency that comes with the huge foreign exchange earnings accrued from the export of natural resources, the domestic currencies of these countries continue to depreciate over time. This could be attributed to the high level of dependence of these economies on import goods and high cost of governance which occasions the extreme manifestation of the spending effect of the Dutch disease and increases demand for foreign exchange to finance the huge increase in demand for imports goods. Also, their low income disposition prompts increment in minimum wage by the government, another means through which the spending effect is made manifest; such increments are usually followed with drastic falls in the value of the domestic currency. Table 3 shows the trend of balance of payments and exchange rate values of designated countries (World Development Indicators, 2019).

There are also countries that the exchange rate values of their domestic currencies neither appreciate nor depreciate in tandem with inflow of foreign exchange, even though they exhibit the resource movement and spending effects of the Dutch disease; they do not exhibit the exchange rate effect at all. This could be because they either have fixed exchange rates or have currencies that are used by several countries or/ and have currencies that are pegged to other currencies.

From the foregoing, it could be deduced that Dutch disease and its economic development implications are not likely to be neutralized by merely expanding international trade or banning importation of some import goods, it could rather be put at bay through surgical policies that are directed towards diversifying and increasing export while allowing for import to the extent that is favourable for the economy. That is, participating in international trade in manners that allow the exchange rate of a country's domestic currency to remain stable. Interestingly, most countries of the world, low income and high income countries alike have the Dutch disease lurking in the shadows of their economies, and would be made manifest if the requisite policies and checks are not put in place to put it at bay consistently.

Does Free Trade Make all International Trade Participating Countries Better-off?

When countries that actively engage in international trade continue to grapple with extreme poverty one cannot help but wonder if these international transactions make them better off or not. Existing international trade theories mentioned the existence of a number of disparities between trading countries including cost of production, technology, natural resources and factor endowments among others as factors believed to prompt international trade between countries. Interestingly, these views seem to have stemmed from the assumption that

international trade is largely about making international sales and purchases in the most prudent fashion, which is a narrow perspective from which to see international trade. Beyond the afore stated differences, international trade has bearing on the general performance of the economy of a country with its attendant effect on the wellbeing of the citizenry. In that light, informed policy makers, especially in countries with very high living standards try to influence trade between their countries and others countries such that the outcomes are not inimical to the wellbeing of the populace, using tariff and non-tariff barriers.

Unfavourable terms of trade put the exchange rate of a country under pressure, as the shortage of foreign exchange needed to finance imports in a country compels its monetary regulatory agency to devalue its currency as a means of easing the pressure. From another dimension, the humongous export of just one or two primary commodities as is the case in many low income countries could result in the over appreciation of a country's currency, spurring drastic decrease in the export of other commodities, especially secondary goods; the 'Dutch disease' syndrome. An ill performing economy structurally skewed to perpetually underperform could be occasioned by unfavourable trade outcomes or the Dutch disease syndrome; this closely describes the economies of many African countries (Kalaitzi & Chamberlain, 2020).

Many of the trade theories, especially the earlier ones, are of the view that countries are better off when they import from countries with advantages in the production of certain goods due to lower cost of production, technology and natural resources among others. However, these theories omit to state clearly what becomes of countries whose productions are not considered advantageous in any way (Thirlwind, 2000). Let us assume that the production of some commodities in country A come with certain advantages over another country B, which is inclined to import from country A. However, there are also these other countries C and D with the same advantage as country A over country B in the production of the said commodity, albeit with a pact with country B. The agreement stipulates country B to import the said products from countries C and D with the understanding that it would be allowed to export to these countries the commodities they are disadvantaged in their production.

Two facts could be deduced from the conjecture above. Firstly, a country does not become better off by simply engaging in international trade, it becomes better off when it engages in international trade strategically. That is, international trade should be performed with sagacity and understanding of how to effectively regulate the various related economic activities and ripple effects that result from the transactions, such that it ensures that the country becomes better off. Secondly, international trade is comprised of importation and exportation; increase in import and exports do not bring about similar impact in an economy. Hence, initiating policies that will improve international trade does not necessarily amount to increase in export or import. Therefore, knowing which between the duo of import and export, depending on which better serves a country's interest at a particular time, should inform a country of the right policies that will prod its economy on the path of sustainable development.

Exports goods could be categorized into two; primary commodities and manufactures. While primary commodities are exploited natural resources and agricultural products which tend to have little or no value addition before they are exported, manufactures are processed and packaged goods. The percentages of primary goods and manufactures exported as proportions of total export determine a great deal whether a country's participation in international trade could amount to improved welfare for its populace. The primary sector consists of fewer skilled workers, numerous unskilled workers, and the peasant farmers. Export goods of the

primary sector extraction have very low or zero price and/ or income elasticity. This indicates that countries that their exports are largely comprised of primary goods are exposed to the adverse effects of the volatile international market, wherein increases or decreases in their prices or in income levels largely do not instigate anticipated changes in quantity demanded. In that light, countries whose total exports are largely comprised of primary goods are more likely to have their economies exposed to the vagaries of international market and their economic performance inevitably affected by exchange rate and government revenue volatilities that come with it (Kalaitzi & Chamberlain, 2020).

Conversely, manufactures are price and income elastic; this indicates that countries that heavily rely on them for export do not risk huge unhealthy economic exposure. Increases and decreases in the average price of manufactures and their substitutes often bring about decreases and increases in the quantity demanded, offsetting impending economic jerk that could alter anticipated improved economic performance. Developing nations have export compositions that have large proportions of primary commodities while the high income countries have export compositions that largely consist of sizeable proportions of manufactures. In that order, one would have imagined the high income countries would export manufactures to the low income countries while importing their primary products, but it is not often the case. It is rarely the case only when the crops are not grown at all or sufficiently grown in the developed countries, and often occurs under a bilateral agreement when they do.

Protectionist policies are used by governments of many developing and developed countries alike to give advantage to local producers of commodities imported from other countries. The governments of some developing countries have taken a cue from this line of action, and have even gone further to institute bans on the importation of certain goods they consider hazardous to local industries. These clearly imply that international trade makes participating countries better off only when it is done strategically within certain safe zones or if certain conditions are met.

How free is International Free Trade?

There is a semblance of consensus that international trade spurs economic development. Studies have shown that international trade and economic growth have a significant positive relationship, whereas sustained economic growth tends to amount to economic development (Were, 2015; Iyoha & Okim, 2017). Thus, the assertion that international trade is a veritable instrument of economic development is not far from the fact. However, the poor economic positions of some countries that also engage in international trade arouses suspicion that merely engaging in international trade might not be sufficient to make a country better off economically. So, what shape must international trade assume in order for it to be able to nudge an economy on the path of prosperity?

Many trade theories made hypothetical assertions that countries are better off when they engage in international trade, but the supposed lofty gains were said to be attainable on certain terms subtly put forward by these theories. While many of the earliest international trade theories made effort to prove that the potential gain derivable from free trade outweigh those of mercantilism, they highlight various factors they believe prompt international trade without clearly stating if the suppose accrued benefits go both ways (Thirlwall, 2000). In another light, if a country, say country A is inclined to import some commodities from another country, say country B with comparative advantage over it in the production of the said commodities, is country B also expected to import those goods that it has lesser advantage in

their production from country A? What if country A does not have comparative advantage in the production of the commodities in question over country B? What if country B has a trade pact with another country and does not feel obligated to import from country A, notwithstanding that country A imports some goods from country B and has comparative advantage in the production of some of the goods country B has lesser advantage in their production? International free trade does not seem to amount to economic development when it is seen as the unhindered random trade between countries as viewed by most developing countries. It tends to amount to economic development when it is rather seen as the trade amongst countries with a carefully thought-out pattern, forged through bilateral agreements and designed with the clear objective of engendering economic prosperity. This is not far from how the developed countries view international free trade.

The observation above explains why high income countries which are some of the major proponents of international free trade still have in place tariff and non-tariff barriers to international trade. Having access to the markets of the more advanced countries is a tricky issue for many developing countries; they tend to have a somewhat unhindered access when the export commodities are primary goods and/ or are not sufficiently produced locally. Aside the competitive disadvantage firms in developing countries experience due to the economies of scale huge rival firms in developed countries enjoy, some of the firms in the more advanced countries, especially those in the agricultural sector are also given subsidies. For some other goods, especially those that are produced locally, tariff and non-tariff barriers of trade are used to dissuade importation of these goods, giving advantages to local producers.

Many nations around the world, developing and developed alike put in place trade policies that brazenly and/ or tacitly discourage or impede importation of certain goods into their countries, by using quotas, tariffs, and tariff escalation among others. Anderson, Hoekman and Strutt (2001) estimate annual welfare losses of about \$19.8 billion for developing countries. This is said to be about three times the size of loss suffered by developing countries from Organization for Economic Cooperation and Development (OECD) import restrictions on textiles and clothing.

In many high income countries high tariffs are imposed on agricultural products, with the average tariff rate on agricultural products said to be almost the double of the tariff for manufactures. More specifically, more than one third of the European Union's agricultural tariff lines tend to carry duties above 15%, with tariff peaks within the agricultural sector being common among processed products and temperate agricultural commodities. Strong tariff escalation is typically imposed on agricultural and food products by high income countries. This vehemently discourages the development of high value added exports, and hinders diversification in particular, as well as development in general.

Aside the two afore mentioned means through which barriers to trade are deliberately imposed by high income countries on imports from developing countries, complex tariff is also used. A complex tariff refers to the daunting challenges the means of accessing and processing information required to export goods to a country (in this case the industrialized countries) are fraught with. Non-tariff barriers to trade such as safety and standard regulations are often times used to reduce competition from other countries. Developing countries do not find it challenging to meet up with or comply to stipulated regulations or standards because they lack the capacities to do so, it is rather largely because these stipulations and standards are vague, and will always be said to be unattainable even when attained, since they are

invisible walls used to ward off importation of certain goods in the most subtle manner. The fact that the said guidelines and standards are unilaterally imposed does not provide platform for commodities that fall within the category of those that fall short of requisite standards to be independently tested to ascertain the veracity of such claims.

Support to agricultural produces in high income countries is still huge; it is put at about five times the amount given out for international development assistance, which is about \$245 billion in 2000. The dumping of unwanted production surpluses onto the world market through subsidies tends to depress prices of a number of agricultural commodities in the international market. Within the same period, the total support to agriculture in the Organization for Economic Cooperation and Development (OECD) reached about 1.3% of the GDP of the member countries put together, put at about \$327 billion (Anderson, Hoekman & Strutt, 2001).

Imposition of barriers to trade is also common in developing countries. Although the high dependence of these nations on imports from the industrialized nations, the high prevalence of corruption and poor implementation of policies tend to dampen the resolve of the progenitors of such policies and scuttle chances of achieving desired goals. Also, the governments of the developing nations are made to acquiesce to the pressure from the leaderships of the more advanced nations to rescind their resolves regarding imposed high tariffs or bans, using their influence in the Bretton wood institutions and international aids as leverages.

Import duty is a veritable source of revenue for developing countries, however, developing countries with expanding industrial sector and overzealous leaderships impose outright ban on certain goods that are locally produced, as they perceive the imported goods as threats to local industries. Outright ban has not proven to be an effective policy that spurs industrialization. This is because the absence of competition occasioned by the ban grants monopoly advantage to local producers and even erodes the economic gains that come with competition amongst the producers due to the scarcity that results from insufficient production. Hence, the local firms are not usually eager to fill the gap between quantity produced and quantity demanded, let alone producing at internationally competitive prices and qualities.

International Monetary System and International Trade

The international monetary system provides the means of payment acceptable to buyers and sellers of different nationalities, including deferred payments. Generally accepted means of payment between countries have taken different shapes and forms over several centuries; from the barter system to the use of precious metals, the use of coins made out of silver and gold to the use of fiat money, and the digital currencies in their various forms. Fiat money tends to be the most popular medium of exchange in recent times; even the variously adopted means of payments like checks, promissory notes, and credit transfers are mostly used in lieu of fiat money or have fiat money as the standard for measurement.

The exchange of goods for some other goods or for money is a venture that leaves the parties involved better off, else they would want to explore other options. Long before the industrial revolution period, trade was largely individualistic, that is, trade occurred mostly between individuals or groups of individuals. As at then, the aggregate trade between nations was given little or no consideration. This is not unrelated to the fact that the media of exchange were different from what obtains in the global economy presently. Media of exchange used for international transaction have origins that transcend one country, region or empire. Aside the barter system where goods were exchanged for other goods, some of the most popular

means of exchange that held sway include silver, gold, gems and cowries among others. Even some of the first sets of bank notes offered in lieu of gold were issued by gold smiths with deposit of gold of the bearers of the bank notes. During this period, international trade thrived unabatedly as most of the rulers that reigned as it were benefited from these trades through tax remittances. However, the simple economics of buying and selling changed from simple to complex the moment most countries of the world introduced their various currencies.

The prevailing international monetary system in the world today is one that occasions most international transactions to be carried out in a basket of few currencies. Save for business transactions between neighbouring countries, most transactions between countries are carried out using currencies of some select countries as the media of exchange; and in that line, the currencies of the trading countries are first converted to one of the vehicle currencies before it is converted to the currency of the other trading country. These vehicle currencies include the United States Dollar, the European Union Euro, the British Pounds Sterling and the Chinese Yuan. Consequently, it behooves every country to not just engage in international trade but to also export goods and services in quantities and values that would afford it sufficient foreign exchange to facilitate importation seamlessly and to also ensure the stability of its currency. It is the demand and supply of a nation's currency that determines the exchange rate value of a nation's currency, while export of export goods brings about increase in the demand for a nation's domestic currency, import of import goods brings about increase in the demand for foreign exchange. Excessive demand for foreign exchange results in the devaluation of the local currency and increases the value of foreign currencies simultaneously, all things being equal (D'Arista, 2001).

When a country's import exceeds its export, it is said to have an unfavourable balance of trade, a disposition that will most likely lead to domestic currency devaluation if the negative gap continues to widen. A decrease in the exchange rate value of a country's currency, even though it makes a country's export more competitive in the international market, lowers standard of living through the reduction of the purchasing power of the domestic currency. Conversely, when export exceeds imports, it results in a favourable balance of trade which leads to the appreciation of the domestic currency. An increase in the exchange rate value of a domestic currency makes a country's export goods more expensive and less competitive in the international market. Save for commodities with low price and income elasticities, huge increases in appreciation of domestic currency could lead to decrease in export which could exert negative ripple effect on unemployment and personal income. However, appreciation of the domestic currency improves standard of living since imported goods become cheaper, leaving consumers with more money to carter for other needs (See table 2).

In situations where the major export goods are primary goods and are almost price and income inelastic, individual exporting countries are usually price takers and as such the quantities of export goods exported do not often change with changes in the exchange rate values. With the entrenchment of an international monetary system where most countries have their generally accepted unique means of exchange, which are mostly fiat money as obtainable in recent times, the gains accruable from international trade now transcends the immediate gains derivable from exporting or importing goods. The value of net export tends to affect the value of the currencies of nations, which invariably has implications on their economic development (Ball, 1982). Table 3 shows the balance of payments of select African countries and their average annual exchange rate.

2. Literature Review

International trade theories could be broadly categorized into two: the traditional trade theories and the modern trade theories. The traditional trade theories which are also referred to as the classical trade theories are the postulations of Adam Smith and David Ricardo. Free trade as against the mercantilist policy of protectionism was championed by both Smith and Ricardo as a means to achieve production efficiency. The Adam Smith model describes trade taking place between countries as a result of the absolute advantage some countries have over others in the production of certain goods. Smith's international trade theory lays emphasis on minimization of aggregate real cost and efficient resource allocation without due consideration for comparative cost. The Ricardian theory of comparative advantage made effort to accommodate the perceived deficiencies in the Adam Smith absolute advantage theory. According to him, comparative advantage arises due to differences in technology or natural resources, albeit the theory fails to make a direct consideration of factor endowments. This loophole was filled by the Heckscher – Ohlin model which followed suit. It was developed by the duo Swedish Economists, Eli Heckscher and Bertil Ohlin who held the view that the pattern of trade is determined by differences in factor endowment.

The Stolper – Samuelson theorem is another fascinating trade theory that trailed the Heckscher – Ohlin theory. The theorem underscores the sequacious rise in income earned from resources that are not intensively used in its production that results from increase in the price of export commodities on one hand and also the attendant decrease in income earned from resources intensively used in its production that derives from fall in price of the export product. The Stolper – Samuelson theorem stipulates that an increase in the price of a good will cause an increase in the price of the factor used intensively in that industry and a decrease in the price of the other factor. The Leontief Paradox also generates interest; the empirical test of validity of the Heckscher – Ohlin theory by Wassily Leontief in 1953 led to the emergence of the Leontief's paradox. As a capital intensive country as it were, the United States in the study was expected to export capital intensive goods and import the labour intensive goods; the findings of the study reveals the opposite.

Modern international trade theories try to factor-in salient elements of trade that were not given due consideration by the traditional theories. The new trade theory by Paul Krugman considered factors like foreign direct investment of the large multinational corporations, monopolistic competition and increasing return to scale as tending to paint clearer picture of the nature and trend of international trade in the world today. Amongst the new theories is the New new trade theory as posited by Melitz in 2003. It stresses the advantage firms that engage in international transactions have over firms that produce only for the domestic market. Another interesting new trade theory is the Gravity trade model. The Gravity trade model is in consonance with the Newton law of gravity which is largely affected by physical size and distance. The gravity trade model suggests that the trend of international trade flows in the direction of countries of closer proximity and bigger economic size.

The economic model describing Dutch disease was developed by Max Corden and Peter Neary in 1982. The model explains the causal relationship between the increase in economic activity of a specific sector (usually the exploitation of natural resources), and the decline in economic activities in the other sectors (usually the manufacturing and agricultural sectors). They are of the position that this results from the revenue increases in the growing sector

which leads to the appreciation of the domestic currency and makes export commodities from the other sectors to become more expensive and inadvertently less competitive.

The theory of “National Economics” is traceable to Friedrich List (1789 - 1846). He developed the ‘National System’ of political economy model wherein he advocated imposing of tariffs on imported goods, stating that the cost of a tariff should be seen as an investment in a nation’s future productivity. List further argued that the inherent benefit of a universal free trade accruable to the global economy does disenfranchise the less industrialized countries. According to him, the accrual of the benefits of an unimpeded international free trade to all the nations of the world in a relatively even manner can only be realized if a large number of countries attain to as nearly the same degree as possible of industrialization and civilization, political cultivation and power as the most advanced countries. In his words “...a nation would act unwisely to endeavour to promote the welfare of the whole human race at the expense of its particular strength, welfare and independence. It is a dictate of the law of self-preservation to make its particular advancement in power and strength the first principles of its policy” (Priestly, 2019).

There exist a number of empirical studies that relate to international trade and economic growth; albeit studies with emphasis on the role of international trade in improving economic development by increasing real income tend to be few. The empirical review is comprised of two categories; research works that lay emphasis on international trade and economic growth and development and those that made emphasis on Dutch disease respectively. Reviewing studies on Dutch disease has become imperative due to the scarce availability of studies that relate to international trade and economic development. A country with a depreciating currency and high inflation rate could also experience marginal increase in economic growth, and in that light the inimical economic effects that stem from unfavourable international trade outcomes are not easily noticeable. Also, Dutch disease gives a plausible explanation as to why and how international trade deleteriously affects economic development.

Taking cognizance of the findings of related studies wherein exports have been found to have positive effect on economic growth and also negative impact on economic growth obtainable in situations where primary goods comprise a large share of total exports, Kalaitzi and Chamberlain (2020) tried to investigate whether exports are the cause of the significant growth that has been experienced in the Gulf Cooperation Council (GCC) since the early 1970s. The findings of the study reveals that exports do not cause economic growth in Oman and United Arab Emirates, while the reverse is the case in Kuwait and Saudi Arabia.

Zahonogo (2016) investigated how trade openness affects economic growth in developing countries, with a focus on 42 sub-Saharan African countries covering the period 1980 to 2012 and using the pooled mean group estimation technique. The result of the study indicates that a trade threshold exists, below which greater trade openness has beneficial effects on economic growth and above which the trade effect on growth declines. His findings support the view that the relationship between trade openness and economic growth is not linear for sub-Saharan Africa.

Were (2015) empirically examined the differential effects of trade on economic growth and investment based on cross-country data. The results were found to be largely consistent with the positive impact of trade on economic growth as found in the literature. The results based on different categories of countries show that while trade has positively impacted on economic growth in developed and developing countries, its effects is insignificant for least

developed countries (LDCs), which largely include African countries. Additional results nonetheless suggest that trade is a key determinant of foreign direct investment (FDI) across all country groups including LDCs.

In an attempt to underscore the impact of exchange rate on international trade, balance of payments and overall economic performance, Nacifa (2013) investigated the relevance of exchange rates in international trade by analyzing the impact that exchange rate volatility and misalignment have on international trade. The study made effort to explore whether exchange rate misalignments affect governments' decisions regarding trade policies using fixed effects models on a detailed panel data set comprising about 100 countries over a 10-year period (2000 - 2009). The finding of the study is generally in line with those of recent related studies supporting the importance of exchange rate misalignment, while disregarding that of exchange rate volatility.

Putting into consideration the antitrade sentiments that still persist, even with development concerns placed at the core of reform negotiations at the World Trade Organization, in which two thirds of the members are developing countries, Fabiosa (2008) considered the impact of agricultural trade liberalization and food consumption through changes in income and prices. He used quantified impacts of agricultural liberalization on economic growth and world commodity prices and traced their likely impacts on the food consumption of small and underrepresented stakeholders in developing countries. The results of his study show overriding evidence that poorer households in developing countries actually benefit more in terms of higher consumption as a result of agricultural trade liberalization.

Bearing in mind the potential inherent static and dynamic gains to be derived from trade between countries, and making emphasis on the fact that existing theories never suggested equitable distribution of these gains, Thirlwall (2000) used the main models of export-led growth to assess the veracity of the findings of recent studies that suggest that regional trade agreements reduce growth and investment while generalized trade liberalization in the form of unilateral tariff reductions improves growth performance. From his assessment, he concluded that most developing countries are constrained in their growth performance by a shortage of foreign exchange and could therefore grow faster with more export.

From the Dutch disease dimension, Oreiro and Silva (2019) attempted to use new developmentalist model of structural change to explain the income position of some middle income Latin American countries. They adopted a synthesis between ideas presented by the classical development theory and post Keynesian theory of demand led-growth to explain the Middle Income Trap (MIT) position of these countries, attributing it to the sudden appearance of the Dutch disease or seizure to neutralize it due to the discovery of natural resources and/or the adoption of an external savings growth strategy.

With the assertion that resource poor nations outperform the resource rich nations, Muhammad (2018) tried to trace the history of the prevalence of the Dutch disease in Nigeria and how it affects manufacturing industry. His findings revealed that Dutch disease affects manufacturing and other performance indicators including capacity utilization, cost of production, and installed and actual efficiencies.

Abdlaziz, Naseem and Sleasman (2018) attempted to investigate the long-run relationship between oil price and value-added share of agriculture as a proportion of GDP in 25 oil exporting countries. They used the panel heterogeneous co-integration test and fully modified ordinary least squares (OLS), dynamic OLS and pooled mean group methods to examine the

long-run effect of real oil price and real exchange rate on agriculture. The result of the study shows negative and significant effect of oil price and exchange rate on agriculture value added, indicating existence of Dutch disease and de-agriculturalization in oil exporting countries.

Andrade and Duarte (2017) investigated the impact of foreign aid on the economies of some central and eastern European countries through its effect on the real exchange rate, with the assumption that foreign aid has effects similar to a boom in natural resource. They used the General Method of Moments (GMM)-system estimator's model to establish the impact of capital flows on output growth via the determination of real exchange rate in a group of central and eastern European countries under scrutiny. They found the positive influence of external capital inflows, and in particular European structural funds in the determination of the real exchange rate for output growth rate in these economies.

Lopez (2017) made effort to analyze the phenomenon of premature deindustrialization for Columbia and seven other Latin American countries. He used a Koyek transformation model for the Columbian case, and panel data fixed effects model for the complete sample of eight Latin American countries. The study concludes that the fall in the average effective tariff in the region is the main economic explanation of the premature reduction in the manufacturing share. It also provides evidence that relates the negative performance of manufacturing to foreign investment flows and to Dutch Disease.

Nchor, Kolman, Strelec and Darkwah (2015) investigated the impact of the new oil sector on the economic performance of major traditional sectors of the Ghanaian economy. They used Autoregressive Distributed Lag (ARDL) Model to evaluate the impact of oil resource on traditional sectors of the Ghanaian economy via effective exchange rate. The results from the study show that there is no clear case of declining performance of the sectors in terms of output, growth and export earnings as a result of the recent oil production. The study could also not establish a sustained appreciation in the real effective exchange rate since commercial oil production commenced, which does not indicate the presence of Dutch disease.

In his attempt to answer the question posed by Easterly (2003) "Can foreign aid spur growth?" Kallon (2014) investigated the long-run relationship between foreign aid, real exchange rate, trade balance and economic growth in Sierra Leone using the VAR model. His findings reveal that Dutch Disease hypothesis does not hold for Sierra Leone. Accordingly, even though foreign aid is associated with long-run economic growth, its negative impact on the real exchange rate lowers the real income of cash crop farmers, which raises the level of poverty and income inequality in the country.

Hodge (2012) made effort to ascertain the nature of the relationship between real exchange rate and manufacturing in South Africa using Johansen VAR/ VEC co-integration approach. He found that world growth is the single most important determinant of domestic manufacturing, while the real exchange rate has the predicted negative relationship, showing no evidence of Dutch disease specific effect on manufacturing.

Martins (2011) investigated whether large inflows of foreign aid and remittances have had damaging impact on the Ethiopian real exchange rate using a structural time series model. His results suggest that there are two main long-run determinants of real exchange rate in Ethiopia: while trade openness is found to be correlated with real exchange rate depreciations, a positive shock due to the terms of trade tends to appreciate the real exchange rate.

In an attempt to shed light on the blurry relationship between the economy of Botswana and the Dutch disease, Makochekanwa (2009) embarked on a study in an attempt to ascertain why Botswana's economy defies the predicted resource curse. He employed the gravity trade model to test the Dutch disease hypothesis on the country's main export product from the manufacturing, mining and agriculture sectors. The result of the study indicated that diamond exports boosted exports from manufacturing, mining and agricultural sectors instead of hurting the country's exports.

Rajan and Subramanian (2009) examined the effects of aid on the growth of manufacturing in 47 significant aid receiving low income countries, using a methodology that exploits the variation within countries across their manufacturing sectors and corrects for possible reverse causality. They found that aid inflows have systematic adverse effects on a country's competitiveness, as reflected in the lower relative growth rate of exportable industries.

Budina, Pang and Wijnbergen (2007) investigated the possibility of Nigeria's government expenditure extreme volatility through debt-funding as being behind the country's disappointing non-oil growth record since the 1970s instead of the Dutch disease. The study found out that although Nigeria experienced an oil boom in the past, the oil boom failed to halt the country's continued stagnation in the non-oil economy of the country. After a careful examination of the macroeconomic policies over the years and government's management of the wind fall oil revenues, the study concluded that extreme volatility of government's expenditure is the main cause of the disappointing non-oil growth record and not the Dutch disease. The study attributed the country's unfavourable fiscal position to inefficient policies and even worse, government's expenditure which is even more volatile than income.

Levy (2006) embarked on the study of the relevance of agricultural policies in putting Dutch disease at bay in Chad. She used a computable general equilibrium model calibrated for Chad to evaluate the impact of using the country's annual oil revenue for public investment, particularly in the development of road and irrigation infrastructures. She found that improving water access would improve Chad's dependence on food aid and entail a substantial improvement in rural household welfare.

Algieri (2004) took steps in his work to show how Dutch disease has affected the Russian economy since the start of the transition in the early 1990s. He used an extended version of the Balassa – Samuelson model to test one out of four detected symptoms of Dutch disease: (i) real exchange rate appreciation (ii) a temporary improvement in economic situation (iii) decline in the non-booming sector, and (iv) export reduction in the non-booming sector. From his findings it could be deduced that the Russian economy exhibits all the symptoms and is thus infected by the Dutch disease and largely vulnerable to exogenous shocks.

Fielding and Gibson (2011) examined aid inflows in 26 sub-Saharan African countries using a simple time-series model in which the effect of aid on relative prices and output is estimated in reduced form to estimate the impact of aid inflows on the real exchange rate and output. The findings reveal that aid inflows cause a real exchange rate appreciation in most of the countries.

3. Research Method

3.1. Theoretical Framework

The study is anchored on List's "National Economics" model. Friedrich List (1789 – 1846) developed the National Economic model as written in his most famous work, *National System of Political Economy* (1841). As stated in his book, List expressed his conditional support for free trade despite his opposition to unbridled free trade as advocated by the laissez-faire proponents. According to him, nations pass through four stages in their economic development process and that a nation's trade policies should correspond to its current stage of development. Consequently, List advocates that countries should engage in free trade only in the first and last stages of development, as doing so in the intermediate (second and third) stages of development could hamper a nation's progress as it seeks to move through the stages (Priestly, 2019).

List viewed the economies of individual countries and the economy of the entire world as two extremes and holds that countries' economies, especially during their intermediate stages of development are better considered when viewed from an individual nation point of view, which is what he termed 'national economics.' List started out as an opponent of the practice of free trade on the basis that underdeveloped nations are not yet ready for foreign competition. To some point, List does agree with Smith that free trade is ideal, but holds that if it were implemented before a nation's manufacturing sector were mature, then free trade would result in a country's market being dominated by stronger countries with more mature manufacturers, and thus, their national interests would be undermined. In that line of thought, List supported free trade within a country, but recommends the use of tariffs during trades between countries to protect infant industries.

List's fundamental doctrine was that a nation's true wealth is the full and many sided development of its productive power rather than its current exchange values. He also opined that an economically mature nation is a nation with a developed agriculture, manufacturing and commercial sectors. However, the last two sectors are more important, since they better influence the nation's culture and independence and are especially connected to navigation, railways and high technology. Friedrich List's theory does not argue against free trade, he rather argues against unconditional removal of the various import restrictions whose unavailability would not only scuttle the revenues accruable to the government in the form of import duties and tax receipts but could also put a nation's productive capacity in near peril, especially when done at economically unhealthy stages of development of the country. This is informed by the belief that the ultimate benefit derivable from engaging in international trade is improvement of the average welfare of the citizenry of the participating countries.

3.2. Model Specification

Taking a cue from Iyoha and Okim (2017) who specified economic growth as a direct function of export proceeds and other economic occurrences affected directly or indirectly by international trade, and giving it a tilt to accommodate arguments made in the work, the study thereby expresses economic development as a function of balance of payments which is largely determined by net export of goods and services, the countries' states of economic development and other relevant economic factors.

The functional relationship is therefore specified as follows:

$$ECM = f(GPC, BOP, TEX, MEX, EXC) \quad (1)$$

We take the first-lag of the dependent variable and re-specify equation (1) in dynamic panel econometric model as:

$$ECM = a_0 + a_1 ECM_{t-1it} + a_2 GPC_{it} + a_3 BOP_{it} + a_4 TEX_{it} + a_5 MEX_{it} + a_6 EXC_{it} + \gamma_{it} + \varepsilon_{it} \quad (2)$$

Where:

ECM = Economic misery

ECM_{t-1} = First-lag of economic misery, the dynamic variable

GPC = Annual GDP per capita growth rate

BOP = Balance of payment

TEX = Total export as percentage of GDP

MEX = Manufacture export as percentage of merchandise trade

EXC = Average annual exchange rate per US dollar

γ_{it} = a between-country error term

ε_{it} = a within-country error term

i = observational units

t = time

3.3. Method of Estimation

The Arellano-Bover/ Blundell-Bond System Generalized Method of Moments (System-GMM) estimation technique is employed in estimating equation (2). This technique is more appropriate and hence adopted, given the fact that the presence of ECM_{t-1} in equation (2) could lead to autocorrelation. Also, GPC and TEX are likely to be endogenous, in addition to the time-invariant country-specific characteristics (the country-fixed-effects) such as geography and demography that could correlate with the explanatory variables. The country-fixed-effects are captured in the error term which is comprised of both the unobserved country-specific effects (γ_{it}) and the observed specific errors (ε_{it}) as specified in equation (2). Acemoglu, Johnson, Robinson and Yared (2009) are of the position that endogeneity and other econometric problems inherent in the dependent and independent variables' dynamics can be solved using GMM. Also, GMM will still produce robust estimates even if the models were to be heteroscedastic or have correlation errors (Nawaz, Iqbal & Khan, 2014).

The instruments could be weak at the first-stage of the two-staged least square (2SLS) regressions if the fixed-effects instrumental variables estimation (two-staged least squares or 2SLS) technique is employed. In that light, the technique will result to bias and inconsistent estimates that suggest ε_{it} is independently and identically distributed (i.i.d). The presence of, say γ_{it} in the equation for estimation makes both the standard fixed effect and random effect estimators to be inconsistent. Again, the system GMM estimator is about the most appropriate estimator in this circumstance since it makes use of variables in their level form with lagged differences as instruments. The GMM estimator which combines the moments conditions of the model in first differences and those of the model in levels (differences are used as instruments for the level equations) is known as system-GMM. This allows for estimation

with lower bias and higher accuracy (Bond, 2002; Arellano & Bover, 1995; Blundell & Bond, 1998).

Also, it is appropriate to begin the estimation with the test of stationarity of the variables. Consequently, the stationarity of the variables will be tested using the Im, Persaran and Shin - IPS (2003) test and Breitung and Das (2008) test. The IPS test is a t-bar statistic dependent on the augmented Dickey-Fuller Statistics (Dickey & Fuller, 1979). The Kao test is employed to test for the cointegration of the variables. On the other hand, the post estimation tests to be conducted include: the Wald chi2 (11) test, Arellano-Bond test for zero autocorrelation and the Sargan test of over identifying restrictions.

3.4. Data and Data Sources

The data for the study are sourced from the World Development Indicators (World Bank, 2019); the study is comprised of 17 African countries and cover the period 1995 to 2018. The dependent variable is economic misery and is measured by the Arthur Okun's misery index. Dudley Seers (1969) is of the position that economic development is largely about what happens to income, unemployment, unemployment and inequality. In that light, the Okun's misery index factors-in the impact of unemployment and rate of inflation in its measure of the lack of economic development, making it an appreciably good measure considering the complexity of the concept and the traits it exudes. The lagged form of economic misery is one of the independent variables used in the study. This depicts List's argument that a country's stage of development should determine its trade policy, which invariably determines the impact of international trade on a country's economic development.

Other independent variables used in the study include economic growth, net export, total export, manufacture export and exchange rate. As a core determinant of economic development, economic growth was introduced into the model as a control variable; the annual GDP per capita growth rate is used to measure economic growth. Balance of payments was used in lieu of net export, since net export makes huge contribution towards its outcome and captures more effectively the impact of the external sector on exchange rate and economic development in general. Total export is measured by total export as percentage of GDP; the total value of export commodities as a proportion of total economic activities of the individual countries is captured here. It has been argued that the composition of the basket of export goods of a country determines the nature of the impact of its trade with other countries on its economy, especially manufactures as against primary commodities. Manufacture export is measured by manufacture export as percentage of merchandise trade. Exchange rate is measured by the average annual exchange rate per US dollar.

4. Finding and Discussion

Estimation of the regression equation was preceded by an examination of the descriptive statistics of the variables in the model. This is to have a glimpse of the time-series behaviour of the pooled panel data set for the study. The result is presented in Table 4 below.

From Table 4, BOP, TEX, MEX, GPC and EXC have standard deviation values that are close to their respective mean values. That is, the values of balance of payment, total exports, manufacturing exports, GDP per capita growth rate and exchange rate hover around their respective mean values. The value of economic misery on the other hand, has high standard deviation value, which is far greater than its mean value. This means that the variable is farther away from its mean value. The minimum values of all the variables are less than their

respective mean values, while the maximum values of the variables are greater than their mean values respectively. The skewness test shows significant p-values for all the variables at the 5 per cent level except for GDP per capita growth rate. Therefore, the null hypothesis of the normal distribution of the variables is rejected except for GDP per capita that is accepted at the 5 per cent level. Similarly, for the Kurtosis test, the significant p-values indicate that the variables are significantly different from the kurtosis of normal distribution at the 5 per cent level

Table 4. Mean, standard deviation, maximum values, minimum values, skewness and kurtosis of the variables

Variables	ECM	BOP	TEX	MEX	GPC	EXC
Mean	142.682	-1.1600	27.9804	20.9075	2.4192	2.3800
Standard Deviation	1710.872	4.7500	15.8265	17.0996	4.8287	4.8100
Minimum value	-3.1402	-2.3600	5.1508	0.2069	-36.8299	0.0087
Maximum value	24529.63	2.4400	87.2831	76.1356	36.9809	9.7200
Pr(Skewness)	0.0000	0.0000	0.0000	0.0000	0.1065	0.0000
Pr(Kurtosis)	0.0000	0.0000	0.0000	0.0012	0.0000	0.0000
Obs.	N = 408 n = 17 T = 24	N = 408 n = 17 T = 24	N = 408 n = 17 T = 24	N = 408 n = 17 T = 24	N = 408 n = 17 T = 24	N = 408 n = 17 T = 24

Source: Author's Computation

From Table 5, none of the p-values of the variables, according to the Breitung test is significant at levels. Therefore, the variables were differenced once and the test was conducted again. At their first difference, all the variables became significant at the 5 per cent level. For this reason, the null hypothesis that all panels contain unit roots is rejected, implying that the variables are integrated of order one, I(1). The Im, Pesaran and Shin (IPS) test also show a similar result. At level, none of the test statistics was significant. However, at their first difference, the test statistics of the variables were significant, hence, supports the rejection of the null hypothesis at the 5 per cent level. In essence, the test results from both tests show that the variables are integrated of order one, I(1).

The variables were also tested for unit root using the Breitung and the Im, Pesaran and Shin (IPS) unit root tests and the results are presented in Table 5 below

Table 5: Breitung and Im, Pesaran and Shin (IPS) unit root test results

Variable	Breitung unit-root Test Result		Im, Pesaran and Shin (IPS) Test Result		~I(d)
	<u>Level</u>	<u>1st Difference</u>	<u>Level</u>	<u>1st Difference</u>	
ECD	-1.9745 (0.1577)	-9.4419* (0.0000)	-1.2110 (0.1622)	-5.2654* (0.0000)	I(1)
BOP	-1.4362 (0.0755)	-11.5396* (0.0000)	1.8763 (0.9697)	-10.1945* (0.0000)	I(1)

Table 5. Continued

Variable	Breitung unit-root Test Result		Im, Pesaran and Shin (IPS) Test Result		~I(d)
TEX	-0.0010 (0.4996)	-8.3740* (0.0000)	-0.7902 (0.2147)	-10.9204* (0.0000)	I(1)
MEX	-1.8710 (0.1621)	-4.7394* (0.0000)	-0.3619 (0.6115)	-5.0870* (0.0000)	I(1)
GPC	-0.0381 (0.2311)	-4.5191* (0.0000)	-0.1641 (0.3217)	-9.0174* (0.0000)	I(1)
EXC	-1.9367 (0.7061)	-13.6748* (0.0000)	-0.6929 (1.0000)	-10.4575* (0.0000)	I(1)
(1) The Breitung and the IPS p-values are presented in parenthesis. (2) * denotes significant at 5% and the rejection of the null hypothesis of the panels containing unit-roots.					
Cross-sectional means were removed to help control for possible correlation of panels.					

Source: Author's Computation

Since the variables are integrated of the same order, the cointegration of the variables was examined using the Kao panel cointegration test and the result is presented in Table 6 below.

Table 6. Result of Kao test for cointegration

Test Statistics	Statistic	p-value
Modified Dickey-Fuller t	-21.9151	0.0000
Dickey-Fuller t	-14.9659	0.0000
Augmented Dickey-Fuller t	-7.8063	0.0000
Unadjusted modified Dickey-Fuller t	-23.2544	0.0000
Unadjusted Dickey-Fuller t	-15.0484	0.0000
The model underlying the reported statistics includes panel-specific means and panel-specific AR parameters and does not include a time trend. Bartlett kernel with 2 lags was used, as selected by the Newey–West methods, to adjust for serial correlation.		

Source: Author's Computation

The reported statistics of the Kao test are all significant. For this reason, the null hypothesis of no cointegration is rejected at the 5 per cent level. This means that there is cointegration among the variables in the regression model. The model specified for the objectives was estimated using the system GMM estimator. The result is presented in Table 7 below.

Table 7: System GMM regression result

RGDP	Coefficients	Standard Errors	t-stat	P-value
BOP	1.6500	1.2600	0.01	0.990
TEX	17.1373	6.3211	2.71	0.007
MEX	30.7633	8.5333	3.61	0.000
GPC	26.8169	8.3272	3.22	0.001
EXC	2.1800	9.2500	23.59	0.000
ECM_{L-1}	0.0060	0.0038	1.58	0.114
Constant	-741.8087	368.9474	-2.01	0.044
Wald chi2(8)				
109100.80 (p = 0.0000)				
Arellano-Bond Test:				
AR (1)				
-0.96151 (p = 0.3363)				
AR (2)				
-1.186 (p = 0.2356)				
Hansen Test				
6.6696 (p = 1.0000)				

Source: Author's Computation

From Table 7, balance of payments has a positive coefficient of 1.6500 with a t-value of 0.01. The insignificant t-value of 0.01 indicates the acceptance of the null hypothesis and suggests that balance of payments has no statistically significant effect on economic misery. The insignificant p-value means that there is a significant error in rejecting the null hypothesis. The coefficient for total export is 17.1373 with a t-value of 2.71. Since the t-value of 2.71 is significant, the null hypothesis of total export having no statistically significant effect on economic misery is rejected at 5 per cent level of significance. The significant p-value indicates that there is an insignificant error in rejecting the null hypothesis.

Similarly, manufacture export has a positive and statistically significant effect on economic misery while GDP per capita growth rate has a coefficient of 26.8169, with a t-value of 3.22. Exchange rate has a positive coefficient of 2.4600 with a significant t-value of 23.59. The positive coefficient of the lag of economic misery (ECM_{L-1}) implies that the current level of misery is also determined by the initial level of misery.

The significant Wald chi2(9) p-value indicates that the explanatory variables have a joint significant impact on the dependent variable. The p-values of the Arellano-Bond test for the first and second-order autocorrelation are statistically insignificant at the 5 per cent level. Therefore, the null hypothesis of no first and second-order autocorrelation in the disturbance term cannot be rejected. The Hansen test confirms the validity (homogeneity) of the set of instruments. The null of the validity of the instruments is accepted, given the insignificant Hansen p-value.

5. Conclusion

The study examined the effect of international trade on economic misery in select African countries, in an effort to determine the impairments that tend to impede African countries from optimally reaping the developmental gains inherent in partaking in international trade which seems to also worsen the economic misery the populations endlessly contend with. The findings of the study reveal that balance of payments, total export, manufacture export, per capita GDP growth rate, exchange rate and lagged form of economic misery all have positive effect on economic misery. While the effects of total export, manufacture export, per capita

GDP growth rate, and exchange rate on economic misery are significant, those of balance of payments and lagged form of economic misery are insignificant. From the results of the analyses it could be deduced that many African countries have external sectors that are not structured in ways that engender economic development, even when they experience marginal increases in exports. Put differently, the engagement of Africa in international trade as it were stands to exacerbate economic misery of the continent instead of prompting improved economic wellbeing.

From the results of the analyses above, the study is of the position that total export, manufacture export, per capita GDP growth rate and exchange rate are more inclined to worsen economic misery than improve economic development in Africa, given the prevailing modus of their engaging in international trade. There are a number of reasons as to why the relationships between these variables have assumed unusual dimensions. That increase in total export stands to bring about increase in economic misery should conventionally suggest the existence of Dutch disease, notwithstanding the glaring records of steady depreciation of the exchange value of the countries in question. However, that increase in manufacture export would amount to increase in economic misery makes the two scenarios inextricably complicated. Increase in manufacture export should imply that new industries will be built and while the older ones get refurbished, and all things being equal, more persons get employed while economic misery wanes down.

An opposite of the scenario painted above, wherein increase in manufacture export spurs increase in economic misery as could be deduced from the result of the analyses suggests two possible scenarios. Firstly, that most of the newly established industries that occasion increase in manufacture export and total export generally, are either infant small scale industries trying to get on their feet or are struggling existing industries attempting to compete with the huge multinational corporations by spreading their tentacles beyond the border. In both cases they eventually go moribund, since the state of economic misery of the inhabitants of these countries becomes worse off; an anathema that can hardly be the case if more persons get permanently employed. Secondly, that the standard of living of the newly employed workers as a result of the recent increase in total export and that of all workers in general become worse off due to the continuous fall in the exchange rate value of the domestic currencies of the countries in question. Currency depreciation results from unfavourable balances of trade and the attendant foreign exchange scarcity that characterize it. The inability of increase in total export to offset negative trade balances is another reason why increase in manufacture export and total export would not improve economic welfare.

In the light of the above, policy makers, governments of African countries and indeed those of other developing countries should first and foremost among other things ensure that trade with the rest of the world results in favourable balance of trade and positive balance of payments, and whenever there is a contrary trade outcome it should not be sufficient to negatively affect exchange rate. Other efforts should include encouraging the production of commodities of the manufacturing sector extraction. They could achieve this by channeling concerted effort towards improving the production capacities of existing domestic industries and building new industries, either by creating investment companies or by providing adequate support to entrepreneurs. Initiating financial policies that stipulate apportioning a sizeable proportion of loanable funds to the industrial sector at lower interest rates and the establishment of industrial estates equipped with adequate infrastructures that will facilitate seamless industrial production are some of the ways to grow industrial capacities.

Also, obsolete trade policies such as outright ban on importation of certain commodities should be jettisoned. Trade policies should be formed from an informed position after due consideration of the stages of development of the countries in question and their core development objectives. Import tariffs should be effectively adjusted such that it improves competitive advantage of the local producers and at the same time spurs improvement in quality and quantity of goods and services produced. Import duties provide a semblance of a fair pedestal for local firms to compete with foreign firms which are usually large multinational corporations who enjoy the benefits of economies of scale. However, when the tariff is too high, just like in cases of outright ban, local firms become reluctant to improve quality and quantity of goods produced and services rendered, since they would already be making mind boggling profits. Generally, international trade on goods and services and other formal and informal international transactions should be largely controlled such that they nudge these economies along the path of improved economic development.

Bilateral trade agreements should also be forged by policy makers since they stand to provide the spring board for local manufacturers to soar higher in the international market and better the chances of recording favourable balance of payments. Multilateral trade agreements have not convincingly proven to have positioned developing countries to reap the potential gains accruable from international trade, this is likely so because some of the signatory countries could be at different development stages as posited by Friedrich List, and in that regard, what works for country A may not work for country B.

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The Relationship Between Exchange Rate and Stock Market Volatilities in India: ARCH-GARCH Estimation of the Causal Effects

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Abstract

With increasing globalisation and integration of national stock exchanges, for the global investor, the portfolio risk increases not only from the local stock market volatility but also in the exchange rate risk. This paper examines the exchange rate volatility effect on volatility in stock market return from India's perspective for the period January 2010 to December 2015, applying ARCH and GARCH estimation. The daily data of the BSE SENSEX returns, exchange rates of US dollar/rupee, British pound/rupee, Euros/rupee are used. It is estimated that the Euro/rupee exchange rate volatility has a significant positive effect on the BSE SENSEX return volatility, while the effect of the US dollar/rupee and British pound/rupee exchange rate the volatilities are insignificantly negative. The larger GARCH parameter over the ARCH term indicates that the own lagged values of the stock return cause more volatility in stock returns than the innovations. There exists a highly persistent effect of shocks to the BSE SENSEX return and the volatility effect wanes only slowly.

Keywords: Exchange Rate, Stock Market Return, Volatility, ARCH and GARCH Estimation

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1. Introduction

Globalisation has resulted in numerous global links throughout the world bringing every nation close to each other and in fact, the modern world is seen as a single global village. This current wave of globalisation has not only expanded the markets for products and economic integration but also the global integration of financial institutions and financial markets. Just like as the growth of an economy is strongly related to its domestic financial markets, where much of the capital for investments is derived from the national stock market, the global financial system with which the domestic financial markets are linked through FIIs is also a critical factor in national achieving economic growth (Muktadir-Al-Mukit, 2012). Rapidly increasing international equity flows create a higher demand for and supply of currencies in which international equity prices are denominated leading to some degree of interdependence between stock market and exchange rate changes. A byproduct of such global integration of financial markets is that the vulnerability of the global financial institutions increases not only

with global economic fluctuation but also with the national economies. The national economies are also highly vulnerable to the volatilities in the international financial markets (Karunanayake, Valadkhani and O'Brien, 2010).

The changes in global financial market also influence exchange rates, the fluctuations of which have repercussions on economies throughout the world. In market economies, the exchange rate instability is ameliorated to some extent through free-floating or managed floating exchange rates (Karoui, 2006). The instability in international markets and volatility of exchange rates affect the stock prices as well as returns in the domestic stock markets and causes stock price volatility. The stock returns volatility is the common measure of financial risk and such stock returns volatility is widely used for hedging, asset pricing, portfolio selection, etc. (Jegajeevan, 2012). Stock market volatility for long has been viewed as a disruption of the capital markets signalling to misprice stocks (Peiris and Peiris, 2011). Especially, firms and individuals with holdings of foreign equities face greater risks of the instability of exchange rates. The performance of portfolio investments and hedging the risk of foreign exchange of international investors are crucially determined by the covariance in currency and equity returns. The same is the concern of policy decision makers as the international investments are very much need for capital investments and the development of their manufacturing.

The Asian financial crisis of 1997-98 and the global financial crisis of 2007 have clearly demonstrated the dynamic links between not only the domestic stock prices and exchange rates but also of their volatilities. The emerging markets have collapsed as a result of a substantial exchange rate depreciation (in terms of US\$) and a significant fall in the stock prices. This has happened not by a shift in trade flows but due to a large shift in the portfolio cross-border movement of funds.

The causal relationship between exchange rate and interest rate is well established. Similarly, there exist a well developed approach to the nexus between interest rate and the stock market performance. However, little is known on the extent of the causal relationship between exchange rate and stock returns. Especially, how the instability of exchange rate influences the international equity returns is not clearly understood and the empirical evidence is inconstant (Mishra, 2004; Solnik, 1987; Zubair, 2013). From an asset pricing viewpoint, the relation of exchange rate with equity returns is determined by the covariance between the returns and risks in exchange and stock markets. Hau and Rey (2006) suggest that due to the portfolio rebalancing effect, the returns on foreign exchange and equity markets is to be negative. A rise in the stock market performance of a foreign country relative to a home country, induces a portfolio investor to sell foreign currency stocks as the investor is overweight in foreign currency equities. The investore then sells the foreign currency proceeds for local currency, thus ensuring neutral postion. At the same time, the foreign currency depreciates with the sale of foreign currency for local currency, while the foreign stock market is outperforming.

In contrast to the returns, the nexus between volatilities in the two markets is is less clear. Notionally, there should exist a positive association between the volatilities in exchange rate and stock markets as the risks in one market leadspills over to the other market. However, few available empirical studies have produced mixed results. The suggestion of a positive association between volatilities in exchange rate and share markets is contrasted with a negative association between them.

The main aim of this paper is to empirically examine the impact of exchange rate volatility on stock market return volatility in India. The paper uses daily market values of BSE SENSEX and the daily exchange rate values of US dollar-rupee, euro-rupee and pound-rupee exchange rates for the period from January 5, 2010 to December 31, 2015. The daily market data of BSE SENSEX is obtained from the Bombay Stock Exchange and the data on exchange rates are obtained from the Reserve Bank of India websites. The standard methods of time series data analysis are carried out. The Augmented Dickey-Fuller (ADF) test is done for stationarity. Empirically, the standard Ordinary Least Squares (OLS), Autoregressive Conditional Heteroscedasticity (ARCH) and Generalised Autoregressive Conditional Heteroscedasticity (GARCH) models are estimated.

2. Review of Literature

Theoretically, the relationship between the exchange rate market and the stock market has been explained by two alternative models: the goods market or flow-oriented model and the portfolio balance or stock-oriented model. The former theory argues that causality runs from the exchange market to the stock market while the latter theory describes that the stock market fluctuations influence the exchange rate market (Khan and Ali, 2015). In the goods market model, international competitiveness and trade balances are influenced by the instability in the exchange rate thus affecting the domestic real income and output. The domestic stock market reacts to the exchange rate changes. The future income, interest rate innovations, current investment and consumption decisions are thus linked to the volatilities in the stock prices and exchange rates (Dornbusch and Fischer, 1980). In the stock-oriented model, the exchange rate balances the demand for and supply of assets. Since stocks form a significant component of financial assets and their current values are based on the present value of their future cash flows, naturally, the movements in the stock prices are influenced by the expectations of relative currency values. Therefore, the dynamics of the shocks or innovations in both the stock prices and exchange rate are casually interrelated (Branson, 1983; Frankel, 1983; Zhao, 2010).

The goods market hypothesis suggests that changes in exchange rates affect the competitiveness of multinational firms and hence their earnings and stock prices. A depreciation of the local currency makes exporting goods cheaper and may lead to an increase in foreign demand and sales. Consequently, the value of an exporting firm would benefit from a depreciation of its local currency. On the other hand, because of the decrease in foreign demand of an exporting firm's products when the local currency appreciates, the firm's profit will decline and so does its stock prices. In contrast, for importing firms the sensitivity of firm value to exchange rate changes is just the opposite. An appreciation (depreciation) of the local currency leads to an increase (decrease) in the firm value of importing firms. Additionally, variations in exchange rates affect a firm's transaction exposure, i.e. exchange rate movement affects a firm's future payables (or receivables) denominated in foreign currency. For an exporter, an appreciation of the local currency reduces profits, while a depreciation of the local currency increases profits. Further, stock prices could be affected by exchange rate movements because such movements will induce equity flows.

According to the portfolio balance approach, exchange rates, like all commodities, are determined by the market mechanism. A booming stock market would attract capital flows from foreign investors and hence causes an increase in the demand of a country's currency and vice versa. As a result, rising (declining) stock prices are related to an appreciation

(depreciation) in exchange rates. Moreover, foreign investment in a country's equity securities could increase over time due to the benefits of international diversification that foreign investors would gain. In addition to returns, capital flows can be induced by the less risky investment climate of a country. An improvement in a country's investment climate such as a stable political system, a fair legal system, financial openness and liberalisation will lead to capital inflows and currency appreciation. Further, movements in stock prices may influence exchange rates since investors' wealth and money demand may depend on the performance of the stock market. For example, during the time of a crisis, a sudden dislocation of asset demands may incur because of the herding behaviour of investors or the loss of confidence in economic and political stability. This dislocation usually results in a shift of portfolio preference from domestic assets to assets denominated in other currencies, implying a decrease in the demand for money. This will lead to a decrease in the domestic interest rate which in turn leads to capital outflows causing the currency to depreciate (Pan et al. 2007).

Empirically, Shapiro (1975), Levi (1994) and Marston (2001) show a positive association between exchange rate and stock market volatilities in the US. It is also shown that the competitiveness and the market values of the firms are directly affected by the exchange rate. Aggarwal (1981) and Agrawal et al. (2010) also report a positive association between exchange rate and stock market volatilities. But, Branson and Henderson (1985) and Frankel (1983), using the portfolio balanced model, demonstrate that the connection between the movements of the exchange rate and the US stock market has a negative relationship. They further depict that at the macro level the domestic wealth falls as a result of a fall in the stock prices and thereby a capital outflow would occur as a result of a drop in the interest rates which creates a reduction in demand for domestic money so that domestic currency gets depreciated. However, Jorion (1990) and Bartov and Bodnar (1994) fail to find a significant contemporaneous relation between US dollar movements and stock returns for US firms. Thus, despite the theoretical association between exchange rate and stock market volatilities, early empirical studies have not produced convincing evidence to support the relationship between exchange rate and stock market movements (Jorion, 1991).

Najang and Seifert (1992) report that the absolute difference in the stock returns has a positive impact on the exchange rate volatility for US dollar movement and stock return for US firms. Sekmen (2011), using ARIMA models on stock returns for the US, observes that exchange rate volatility negatively affects stock returns. Even the availability of hedging instruments could not lessen the negative impact of exchange rate volatility on the volume of trade. Ajayi and Mougoue (1996) and Ajayi et al. (1998) provide evidence for unidirectional causality from the stock market to currency markets for advanced economies and no consistent causal relations in emerging markets.

Donnelly and Sheehy (1996) observe a significant contemporaneous relation between exchange rate and the market value of large UK exporters. Maysami and Koh (2000) argue that the interest rate and the exchange rate should also be considered as determinants of UK stock prices and that obtain a positive association between the UK stock prices and exchange rate. Zhao (2010) empirically examine the dynamic relationship between the Renminbi (RMB) real effective exchange rate and stock price in China with VAR and multivariate GARCH models for the period January 1991 to June 2009. The results show that there is not a stable long-term equilibrium relationship between RMB real effective exchange rate and stock price. There are also no mean spillovers between the foreign exchange and stock markets. Furthermore, the paper examines the cross-volatility effects between foreign exchange and

stock markets using the likelihood ratio statistic. There exist the bidirectional volatility spillovers effects between the two markets, indicating the past innovations in the stock market have a great effect on future volatility in the foreign exchange market, and vice versa.

Among the stock market studies on Asian countries, Ramasamy and Yeung (2002) examine the links between foreign exchange and stock markets and their implications for capital controls in six Asian countries (Bangladesh, Japan, Philippines, Vietnam, China, Indonesia) over the period 1995-2001. They find inconsistent results for bivariate causality between stock prices and exchange rates. Chiang and Yang (2003) show that stock returns and currency values are positively related in six Asian markets (Bangladesh, Japan, Philippines, Vietnam, China, Indonesia). Adjasi and Biekpe (2005) report that relative currency movements influence stock price volatility in these six Asian markets. Pan et al. (2007) also examine dynamic linkages between exchange rates and stock prices in these six East Asian countries. Yau and Nieh (2009) investigate the exchange rate effects of the Taiwan Dollar against the Japanese Yen on stock prices in Japan and Taiwan and find a long-term equilibrium and asymmetric causal relationships.

As far as studies on the stock market in India, Bahmani-Oskooee and Sohrabian (1992) show a bidirectional causality between stock prices measured by the S&P500 index and effective exchange rates of dollar. Apte (2002), using the E-GARCH specification proposed by Nelson (1991), examine whether changes in the volatility of the stock market affect volatility in the foreign exchange market and vice versa in India. The model specification incorporates asymmetric effects of positive and negative return surprises on volatility both within the market as well as spillovers across the two markets. Empirical analysis with one of the major stock market indices supports the hypothesis of such volatility linkages while for the other index there appears to be a spillover from the foreign exchange market to the stock market but not the other way round.

Thus, the exchange rate market and the stock market have both positive and negative associations. Some studies show that the stock market affects the foreign exchange rate while others have also observed that foreign exchange rate affect the stock market. Hence, the causality between the volatility of exchange and stock markets is inconclusive and needs further investigation.

3. Research Method

In order to study the relationship between exchange rate volatility and stock market volatility, this paper uses the daily closing data on the stock market index BSE30 (SENSEX) and the daily closing US dollar-rupee exchange rate, euros-rupee exchange rate and British pound-rupee exchange rate for six years from January 5, 2010 to December 31 2015 with 1440 observations. The stock market data are obtained from the BSE exchange and the historical exchange rate data are taken from Reserve Bank of India websites.

3.1. Generalised Autoregressive Conditional Heteroscedasticity Model

Empirically, this paper follows the generalised autoregressive conditionally heteroskedasticity (GARCH) model. The GARCH (q,p) process can be modelled as:

$$\varepsilon_t = \sigma_t x_t \quad (1)$$

where x_t is a sequence of a i.i.d. random variable and σ_t is a nonnegative process such that:

$$\sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \cdots + \alpha_q \varepsilon_{t-q}^2 + \beta_1 \sigma_{t-1}^2 + \cdots + \beta_p \sigma_{t-p}^2 \quad (2)$$

$$\text{and } \alpha_0 > 0, \alpha_i \geq 0, i = 1, \dots, q, \beta_j \geq 0, j = 1, \dots, p \quad (3)$$

The conditions on parameters ensure strong positivity of the conditional variance in equation (2). Writing equation (2) in terms of a lag-operator B:

$$\sigma_t^2 = \alpha_0 + \alpha(B) \varepsilon_t^2 + \beta(B) \sigma_t^2 \quad (4)$$

$$\text{where } \alpha(B) = \alpha_1 B + \alpha_2 B^2 + \cdots + \alpha_q B^q \text{ and } \beta(B) = \beta_1 B + \beta_2 B^2 + \cdots + \beta_p B^p \quad (5)$$

If the roots of the characteristic equation, i.e.

$$1 - \beta_1 x - \beta_2 x^2 - \cdots - \beta_p x^p = 0 \quad (6)$$

lie outside the unit circle and the process (x_t) is stationary, then equation (2) can be written as:

$$\sigma_t^2 = \frac{\alpha_0}{1 - \beta(1)} + \frac{\alpha(B) \varepsilon_t^2}{1 - \beta(B)} = \alpha_0^* + \sum_{i=1}^{\infty} \delta_i \varepsilon_{t-i}^2 \quad (7)$$

where $\alpha_0^* = \frac{\alpha_0}{1 - \beta(1)}$ and δ_i are coefficients of B^i in the expansion of $\alpha(B)[1 - \beta(B)]^{-1}$. The expression (7) shows that the GARCH (q,p) process is an ARCH process of infinite order with a fractional structure of the coefficients. From equation (1), the GARCH (1,1) process is stationary if the process (σ_t^2) is stationary.

As the data is time series, the presence of unit root and stationarity of the series using the Augmented Dickey-Fuller (ADF) test is to be performed in order to avoid constructing spurious regressions when working with nonstationary time series data. The null hypothesis is that a unit root is present in a time series sample and the alternative hypothesis says that the series doesn't have a unit root. The unit root specification is:

$$\Delta y_t = \alpha + \beta_t + \gamma y_{t-1} + \delta_1 \Delta y_{t-1} + \cdots + \delta_{p-1} \Delta y_{t-p-1} + \varepsilon_t \quad (8)$$

where α is a constant and β_t is the coefficient on time trend and p is the lag order of the autoregressive process. The unit root test is then carried out under the null hypothesis $\gamma = 0$ against the alternative hypothesis $\gamma < 0$.

Empirically, the impact of exchange rate volatility on stock market volatility is analysed first by the OLS method:

$$r_t = \beta_0 + \beta_1 (USD_INR)_t + \beta_2 (EURO_INR)_t + \beta_3 (GBP_INR)_t + \varepsilon_t \quad (9)$$

where r_t is the daily stock returns calculated as the natural logarithm of the daily closing price relative to previous day i.e. $SENSEX_t = \ln[(\text{stock price}_t / (\text{stock price}_{t-1}))]$, $(USD_INR)_t$ is the logarithm of daily exchange rate i.e. $(USD_INR)_t = \ln[(USD_INR_t / (USD_INR_{t-1}))]$, $(GBP_INR)_t$ is the natural logarithm of daily exchange rate i.e. $(GBP_INR)_t = \ln[(GBP_INR_t / (GBP_INR_{t-1}))]$, $(EURO_INR)_t$ is the natural logarithm of daily exchange rate i.e. $(EURO_INR)_t = \ln[(EURO_INR_t / (EURO_INR_{t-1}))]$, $\beta_0, \beta_1, \beta_2$ and β_3 are the coefficients of the parameters, and ε_t is the white noise error term.

The autoregressive conditional heteroscedasticity (ARCH) model describes the variance of the current error term or innovation as a function of the actual sizes of the previous period error, terms often the variance is related to the squares of the previous innovations. Let, $\varepsilon_t = x_t \sigma_t$ where ε_t is the error terms (return residuals, with respect to a mean process). ε_t are split into a stochastic piece x_t and a time-dependent standard deviation σ_t characterising the

typical size of the term. The null hypothesis is that, in the absence of ARCH components, $\gamma_i = 0$ for all $i=1,2,\dots,p$. The alternative hypothesis is that, in the presence of ARCH components, at least one of the estimated γ_i coefficients must be significant. The suitability of the estimated OLS model is then tested with the ARCH test. The ARCH process is specified as follows:

$$r_t = \gamma_0 + \gamma_1(USD_INR)_t + \gamma_2(EURO_INR)_t + \gamma_3(GBP_INR)_t + \varepsilon_t \quad (10)$$

$$\varepsilon_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \dots + \alpha_p \varepsilon_{t-p}^2 \quad (11)$$

The generalised autoregressive conditional heteroscedasticity GARCH (p, q) process (where p is the order of the ARCH term ε^2 and q is the order of the GARCH terms σ^2) is specified as:

$$r_t = \gamma_0 + \gamma_1(USD_INR)_t + \gamma_2(EURO_INR)_t + \gamma_3(GBP_INR)_t + \varepsilon_t \quad (12)$$

$$\varepsilon_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \dots + \alpha_p \varepsilon_{t-p}^2 + \delta_1 \sigma_{t-1}^2 + \dots + \delta_q \sigma_{t-q}^2 \quad (13)$$

where the parameter γ_0 is the intercept, γ_1 , γ_2 , and γ_3 are the coefficients of the estimated parameters of the mean equation, σ_t^2 is the conditional variance, $\alpha_1 \varepsilon_{t-1}^2$ is the news about volatility from the previous period, measured as the lag of the squared residuals from the mean equation which is defined as ARCH term, and $\delta_1 \sigma_{t-1}^2$ is the last period's forecast variance which is defined as the GARCH term.

The GARCH specification requires that in the conditional variance equation, parameters α_0 , α_1 and α_2 to be non-negative and the sum of α_1 and α_2 to be less than one to secure the covariance stationarity of the conditional variance:

$$r_t = \phi_0 + \varepsilon_t \quad (14)$$

$$\sigma_t^2 = \phi_0 + \theta_1 \varepsilon_t^2 + \theta_2 \sigma_t^2 + \eta_1 v(USD_INR)_t + \eta_2 v(EURO_INR)_t + \eta_3 v(GBP_INR)_t \quad (15)$$

where v represents the volatility of the exchange rates calculated through a GARCH (1,1) process to capture the impact of exchange rate volatilities on stock return volatilities.

4. Finding and Discussion

Figures 1 to 3 presents the trend exchange rates of the Indian rupee with the US dollar, euro and British pound for the period January 5 2010 to December 31 2015. All three exchange rate movements show an upward trend from 2012 and peaking at the beginning of 2014. There is also significant volatility in all three exchange rates.

Table 1 presents the variability of the variables in the empirical analysis of the causal relationship between stock prices and exchange rates in India. The skewness is to be 0 and kurtosis to be equal to 3 in order to indicate that the variables are normally distributed. The data are tested for normality through the Jarque-Bera test which shows that the JB test has passed and all variables are normally distributed.

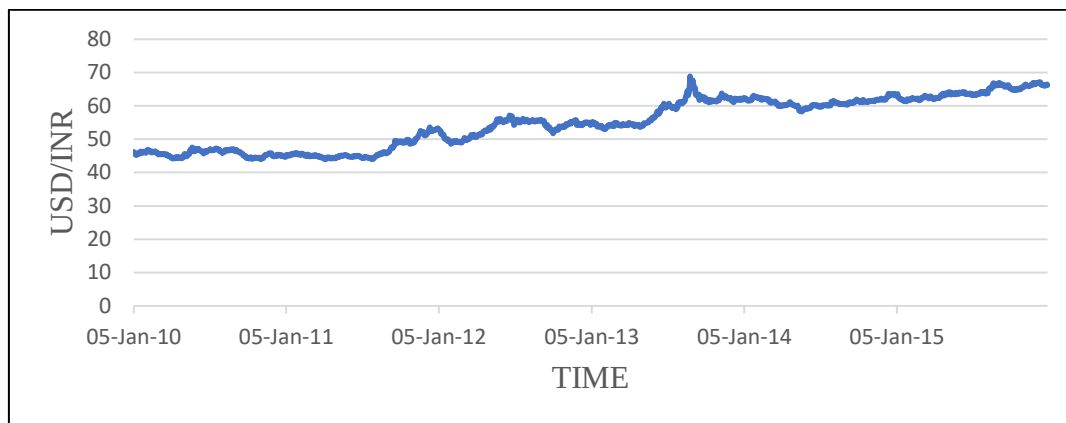


Figure 1 Trend in US Dollar-Indian Rupee Exchange Rate

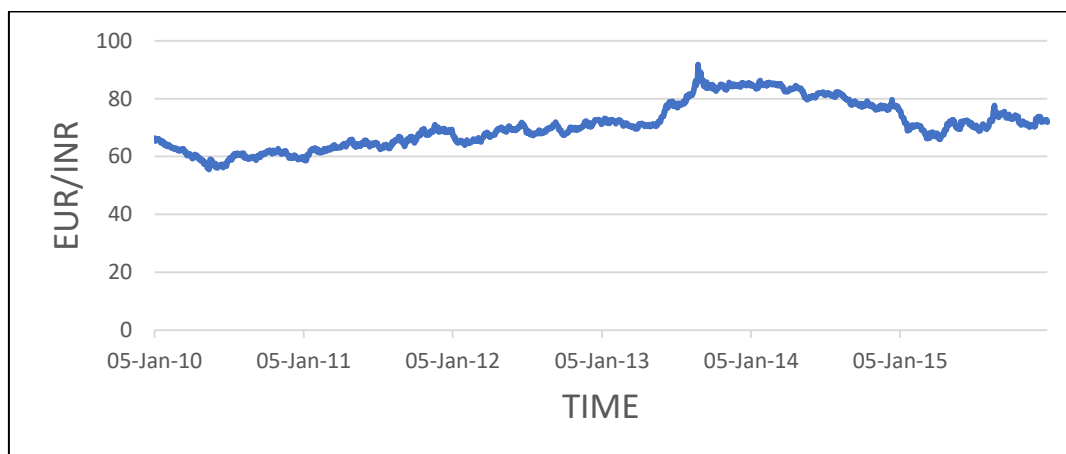


Figure 2 Trend in Euro-Indian Rupee Exchange Rate

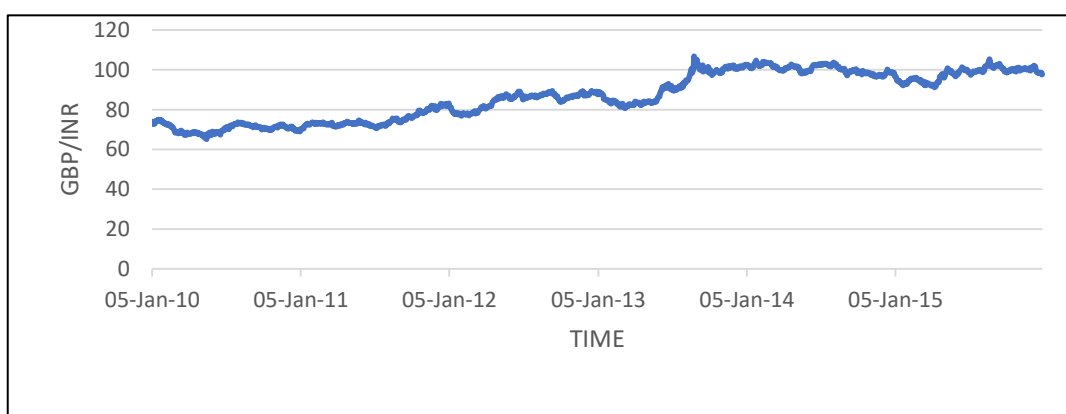


Figure 3 Trend in British Pound-Indian Rupee Exchange Rate

Table 1 Descriptive Statistics of Stock Market Index and Foreign Exchange Rates

Statistic	BSE SENSEX	USD_INR	GBP_INR	EURO_INR
Std. dev.	0.00798	0.0021	0.0038	0.0044
Skewness	0.10956	0.9642	0.1749	0.0183
Kurtosis	3.00204	3.5162	3.3233	3.6751
Jarque-Bera test	1276.26	26235.24	331.889	168.783
Obs.	1440			

The ADF test for stationarity of the variables presented in Table 2 rejects the null hypothesis of a unit root in the levels form as the probability values are less than 0.05. Therefore, all the variables are stationary at levels.

Table 2 ADF Test for Stationarity

Variable at levels	t-statistic	Prob.
BSE SENSEX RETURN	-30.765**	0.000
USD/INR	-17.392**	0.000
GBP/INR	-17.335**	0.000
EUR/INR	-17.573**	0.000

Table 3 presents OLS and GARCH estimates of the effect of exchange rates on the BSE SENSEX returns. In the OLS results, both US dollar-rupee exchange rate and euro-rupee exchange rates have a negative association with the BSE SENSEX returns whereas the nexus between the British pound-rupee exchange rate and BSE SENSEX returns are positive. However, only the US dollar-rupee exchange rate has a significant impact on the BSE SENSEX returns while the British pound-rupee and euro-rupee exchange rates are insignificant in determining the BSE SENSEX returns. The suitability of the regression OLS estimation is tested with the ARCH test if the squared residuals of OLS equation (9) contain autocorrelation or heteroscedasticity. The results of the ARCH test reject the null hypothesis at 1 percent significant level indicating that classical OLS estimated coefficients are not effectively estimated so that inferences based on such coefficients are unreliable.

In contrast to the OLS estimates, the estimated mean BSE SENSEX returns GARCH (1,1) process show that the US dollar-rupee exchange rate has an insignificant impact on BSE SENSEX returns while British pound-rupee and euro-rupee exchange rates have a significant impact on BSE SENSEX returns. However, there is no deviation from the OLS estimates with regard to the sign of the relationship between foreign exchange rates and market returns as the GARCH (1,1) model also produces a positive association between British pound-rupee exchange rate and BSE SENSEX stock market returns while a negative association with other two currencies. The results further reveal that the magnitude of the coefficients are high for the US dollar-rupee exchange rate and euro-rupee exchange rate compared to the British

pound-rupee exchange rate indicating that those currencies are having a relatively strong link with the stock market returns compared to the British pound-rupee exchange rate. The intercept term is positive and statistically significant which indicates that there is a significant time-invariant component in the return generating process.

Table 3 OLS and GARCH Estimates of the Effect of Volatility in Exchange Rates on Stock Market Returns in India

Variable	OLS	GARCH	
	BSE SENSEX return	Mean BSE SENSEX return	Volatility of BSE SENSEX return
USD	-0.334*** (0.114)	-0.111 (0.097)	-
GBP	0.092 (0.080)	0.108** (0.050)	-
EURO	-0.056 (0.064)	-0.113*** (0.038)	-
Constant	0.0005** (0.0002)	0.0005*** (0.0001)	-
R-square	0.007	-	-
Adj. R-square	0.005	-	-
Durbin-Watson statistic	1.598	-	-
F-statistic	0.020	78.795*** (0.000)	-
Obs*R-square		74.811*** (0.000)	
<i>Variance equation</i>			
RESID (-1)²	-	0.162*** (0.017)	0.150*** (0.016)
GARCH (-1)	-	0.826*** (0.016)	0.819*** (0.017)
v(USD_INR)	-	-	-0.027 (0.015)
v(GBP_INR)	-	-	-0.052 (0.040)
v(EURO_INR)	-	-	0.106*** (0.026)
Constant	-	1.41E-06*** (3.15E-07)	1.14E-06 (4.43E-07)

Note: Standard errors in parentheses. *** significant at 1 percent level ** significant at 5 percent level * significant at 10 percent level.

Both the ARCH and GARCH parameters are satisfying the non-negativity condition while both parameters are significant at 1 percent significant level. The GARCH parameter is significantly greater than the ARCH term illustrating that the volatility of stock returns are

more sensitive to its own lagged values than to its new surprises. Consequently, the effect of the previous period's forecast variance is more persistent. In addition, the summation of GARCH and ARCH parameters closer to unity indicates that the shocks to the BSE SENSEX stock returns have high persistent effects and the response to volatility decays at a slower rate.

The estimated exchange rate volatilities of US dollar-rupee, British pound-rupee and euro-rupee on the volatility of BSE SENSEX returns by GARCH (1,1) model indicate a lower and significant ARCH parameter. This shows weak support for the presence of last period's shocks on stock market return volatility whereas a relatively large and statistically significant GARCH parameter provides strong evidence for the presence of previous surprises. Despite the inclusion of exchange rate volatilities, the sum of ARCH and GARCH parameters as a measure of volatility presence is still approximately closer to unity indicating a weak impact on exchange rate volatilities on the stock market return volatilities irrespective of the currency.

The empirical results on the relationship between the volatilities in the stock market index and foreign exchange rates show that the effect of euro-rupee exchange rate volatility is positive and statistically significant on the stock market return volatility. An increase in euro-rupee exchange rate volatility increases the volatility of stock returns of BSE SENSEX by about 10 percent. This is expected as the globalisation as well as open market economic policies, Indian capital market has become a potential destination for foreign investors to park their investments which creates a severe exposure to the foreign currency risk. As an emerging market economy, India still lacks a developed market for hedging instruments to mitigate potential exchange rate risk exposures. This can be a potential reason behind the positive association between euro-rupee exchange rate volatility and stock market return volatility. The empirical results further reveal that volatilities of US dollar-rupee and British pound-rupee exchange rates negatively influence the stock return volatilities but the effects are statistically insignificant.

Diagnostic tests of correlogram of squared residual test and heteroscedasticity test are performed in order to assess the suitability and reliability of the ARCH and GARCH estimation models. The estimated results of the tests are presented in Table 4. In the correlogram test, all Q statistics at all lags under the normal GARCH model are statistically insignificant at 1 percent level indicating no significant serial correlation among the residuals. On the other hand, in the heteroscedasticity test, the p-value of the Obs*R-square is insignificant indicating the non-existence of the ARCH effect.

Table 4 Correlogram of Squared Residual and Heteroscedasticity Tests

Lag	AC	PAC	Q-statistics	Prob.
1	0.036	0.036	1.8548	0.173
2	-0.004	-0.006	1.8814	0.39
3	-0.03	-0.03	3.2117	0.36
4	-0.026	-0.023	4.1591	0.385
5	-0.009	-0.008	4.2898	0.508
6	-0.003	-0.004	4.3037	0.636
7	-0.014	-0.016	4.6086	0.708
8	-0.005	-0.005	4.6387	0.795

Table 4. Continued

Lag	AC	PAC	Q-statistics	Prob.
9	0.036	0.036	6.5348	0.685
10	-0.025	-0.029	7.4414	0.683
11	-0.017	-0.015	7.8387	0.728
12	0.012	0.015	8.044	0.782
13	0.012	0.011	8.2421	0.827
14	0.019	0.017	8.773	0.845
15	-0.033	-0.035	10.379	0.795
16	0.001	0.006	10.382	0.846
17	0.029	0.03	11.625	0.822
18	-0.027	-0.033	12.217	0.808
19	-0.027	-0.024	13.806	0.795
20	-0.024	-0.02	14.62	0.79
F-statistic	1.850	Prob.		0.174
Obs*R-square	1.850	Prob. Chi-square		0.174

5. Conclusion

With the globalisation of capital markets and liberalisation of the capital account, global investors diversify their portfolios across currencies and national stock markets. Since the exchange rate risk and its association with the local stock market is an important component of the overall portfolio risk, this trend can be expected to link the stock market and the forex market more closely. This paper empirically investigates the effect of exchange rate volatility on stock market return volatility from India's perspective. The daily time series data for the BSE SENSEX stock market index and exchange rates of US dollar/rupee, British pound/rupee, Euros/rupee over a period of six years from January 2010 to December 2015 is used in the empirical analysis. In the estimation, this paper applies the ARCH and GARCH models in order to estimate the effect of exchange rate volatility on stock market return volatility. The empirical results of the study reveal that the volatility of the Euro/rupee exchange rate has a positive and significant impact on BSE SENSEX return volatility whilst the effect of the volatility of US dollar/rupee and British pound/rupee exchange rates are insignificantly negative. It is observed that the GARCH parameter is significantly greater than the ARCH term illustrating that the volatility of stock returns is more sensitive to its own lagged values than to its new surprises. The shocks to the BSE SENSEX stock returns have highly persistent effects and the response to volatility decays at a slower rate.

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External Debt, Public Investment and Economic Growth in Cameroon

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Abstract

This study investigates the extent to which external debt and public investment contributes to economic growth in Cameroon - emphasising on how public investment modulates the effect of external debt on economic growth. Time series data spanning the period 1980-2018 obtained from the World Bank's world development indicators are used, together with the Dynamic Ordinary Least Squares (OLS) approach to ascertain the nature of the long-run relationship between external debt, public investment and economic growth. Consistent with the debt-overhang and crowding-out literature, the study reveals a negative significant influence of external debt on economic growth in Cameroon. Results also reveal that there is a positive and significant direct effect of public investment on economic growth in the long run. Further results indicate that public investment and external debt positively and significantly engender economic growth. This is evidence that public investment is modulating the effect of external debt on economic growth in Cameroon. These findings suggest the need for developing country governments to create an enabling environment for private sector development, while accompanying external debt resources with domestic revenue mobilization by broadening the tax base - taxes on landed property being potential candidates.

Key words: External debt, Public investment, Economic growth, DOLS.

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1. Introduction

Economic growth and development remains a major concern of most developing countries; to solve this problem, resources are mobilized from various sources including external borrowing for investment into productive projects for growth acceleration. Sustainable economic growth is the prime concern for all countries, especially developing economies that frequently face burgeoning fiscal deficits mainly driven by higher levels of debt service, particularly external debt servicing and widening current account deficits (Bernardin et al, 2018). The Harrod-Domar growth model has been the source of inspiration for development

economists in explaining the importance of external borrowing in closing the savings-investment gap in developing countries.

The principal reason for governments borrowing is to finance public goods that increase welfare and promote economic growth. The spending has to be financed either through taxation, through seignorage, or with debt. Theoretically, it is expected that developing countries would benefit from external borrowing if the marginal product of capital is higher than the world interest rate (Ogunmuyiwa, 2011).

According to Atigue and Malik (2012), many poor countries become poorer after taking foreign assistance from rich international creditors such as the World Bank, the IMF and the Paris Club have been negligent towards the risk of poverty trap for low income countries.

According to World Bank (2019), Cameroon's total external debt in 2016 was \$8,186 million and increased to \$10,396 million in 2017. This shows an increase of \$2210 million between 2016 and 2017. It has been observed that Public debt in Cameroon has gradually and steadily increased since the debt relief under the enhanced Heavily Indebted Poor Countries (HIPC) and Multilateral Debt Relief Initiatives (MDRI). Total public sector debt (external plus domestic public debt) increased threefold since 2010 to 35.2 percent of GDP in 2016, with about 70 percent of the increase driven by a surge in public and publicly guaranteed (PPG) external debt. The increase in public debt in Cameroon during 2009–2015 (25 percentage points of GDP) was more than double the median for SSA countries (12 percentage points of GDP).

Cameroon's budget for 2019 stood at 4850.5 billion FCFA and 4951.7 billion in 2020. There is an increase of 161 billion or 3.43 percent of the budget of 2019, compared to the previous year budget. The expectation of the government is for the GDP to grow further from 0.9 percent in 2019, to 4.4 percent in the upcoming year (Hugue, 2018). Between 2006 and 2016, public expenditures have increased substantially in Cameroon, the country's total public spending rose substantially from 13 percent of GDP in 2006 to 21 percent of GDP in 2016. This increase financed some of the Vision 2035 and GESP goals, resulting in an increased capital expenditure from 2.6 percent in 2006 to 7.9 percent of GDP in 2016. Over the last decade, the share of capital expenditures in Cameroon's total public expenditure has increased considerably particularly since 2010. This is as a result of the fact that authorities increased public investments to meet the Vision 2035, GESP and Plan d'Urgence Triennal (PLANUT) goals. Between 2006 and 2009, public spending increased by 2.6 percent of GDP. That is from 13.2 percent of GDP in 2006 to 15.7 percent of GDP in 2009 (World Bank, 2018).

Before 1978, Public investment as a ratio to GDP was 2.4%. Between 1978 and 1986, public investments as a ratio of GDP increased to 10.5%. The increase in public investment is explained by the developmental strategy adopted by the government to expand the public sector (Njimanted and Mukete, 2013).

The Growth and Employment Strategy Paper (GESP) 2009 and Vision 2035 (2009) outlined Cameroon's main strategic and long-term goals. In order for Cameroon to achieve its development objective, closing the infrastructure gap is imperative. Since 2000, growth has averaged 3.6 percent which remains well below the 5.5 percent average target rate in the GESP for 2010–20. This potential growth could come from solving infrastructural challenges in power supply by lowering production costs and increasing national access rates, and in

transport services by improving road conditions and transport costs along the main transit corridors to neighboring countries (IMF, 2014).

Since independence in the 1960s, a lot has been done by the government of Cameroon to foster economic growth and development. Among many of such measures are; the five-year economic and social development plan in 1961 to re-enforce and guarantee sustainable growth of the national economy in terms of increase in real gross domestic product (GDP), the introduction of the Structural Adjustment Programme (SAP) in 1988/1989, followed by the devaluation of the FCFA in 1994 after the deduction of civil servants' salaries by over 50 percent. Between the period 1970 and 2003, the total external debt of Cameroon increased from 14.23 percent to 96.3 percent of Gross Domestic Income. But as from 2005, it began to reduce gradually due to progress in the debt reduction; rescheduling and cancellation initiative by the donor community. In 2008, the external debts Cameroon owed the respective donors were only about 1.438 billion US dollar, close to 50 percent reduction from the 1980s levels. The average Gross domestic product (GPD) of Cameroon in real terms has been on the increase since 1970. The real gross domestic product by 1980 was 1410 billion FCFA and by 2008, it stood at some 2840 billion FCFA (Njimanted *et al*, 2015).

The trend of Cameroon's external debt has shown an increasing pattern in recent years. Statistics show that the external debt to GDP ratio of Cameroon in actual terms stands at 21.6 percent in 2015, 25.4 percent in 2016 and 28.2 percent in 2017. Projections show that it will rise to about 29.9 percent in 2019 and then falls gradually to about 23.0 percent in 2038 (IDA and IMF, 2018).

The annual GDP growth rate slowed to 3.2 percent in 2017, the lowest rate in seven years, and the fiscal deficit peaked at 6.1 percent in 2016. Meanwhile, a significant increase in borrowing to fund large infrastructure projects pushed the debt-to-GDP ratio from 15.9 percent of GDP in 2006 to 35.7 percent of GDP in 2017. Between 1986 and 2009, public investment averaged 1.5 percent of GDP even though it is less than half the average for regional comparators (4.1 percent of GDP) and global comparators (3.4 percent of GDP). Between 2011 and 2015, the government of Cameroon boosted capital spending significantly in laudable attempt to narrow its infrastructure gap. Also, public investment increased substantially between 2012 and 2015 from 792.2 billion FCFA to 1150 billion FCFA, respectively (World Bank, 2018).

The concrete reason for a country to contract debt is to invest in productive projects for growth acceleration. According to World Bank (2019), Public debt in Cameroon has gradually and steadily increased since the debt relief under the enhanced Heavily Indebted Poor Countries (HIPC) and Multilateral Debt Relief Initiatives (MDRI). In the same way, World Bank (2018) report shows that between 2006 and 2016, public expenditures have increased substantially in Cameroon, the country's total public spending rose substantially from 13 percent of GDP in 2006 to 21 percent of GDP in 2016. This increase financed some of the Vision 2035 and GESP goals, resulting in an increase capital expenditure from 2.6 percent in 2006 to 7.9 percent of GDP in 2016. The foregoing issues raised bring us to the focal point of this research work which is to examine the extent to which external debt and public investment contributes to economic growth in Cameroon. The study is expected to give results that indicate the effect that exists between external debt and public investments on economic growth.

2. Literature Review

This paper is grounded in the following economic theories:

The Harrod-Domar Growth Model

This model was formulated separately by the British economist Roy Harrod and the American economist of Polish origin Evsey Domar in 1939 and 1946 respectively. Their results were so close to each other that it subsequently became known in scientific circle as the theory of Harrod-Domar. This model explains the place of saving and investment in economic growth.

In the technical conditions of production, economic growth is determined by the marginal propensity to save, and the dynamic equilibrium in the market system is inherently unstable, so that maintaining it at full employment requires active and purposeful actions of the state.

To illustrate the Harrod-Domar growth model, let savings (S) be some proportions, of national income (Y) such that:

$$S = sY. \dots\dots\dots 1$$

Investment (I) is defined as the change in capital stock, K, and can be represented by ΔK such that $I = \Delta K$. Total capital stock, K, is directly related to national income, Y, as represented by the capital-output ratio, k, such that: $K/Y = k$.

This capital-output ratio can also be written in its marginal value as

$$\Delta K / \Delta Y = k \dots\dots\dots 2$$

which is popularly known as the incremental capital-output ratio. Since the equilibrium saving, S, must equal total investment, I, it follows that $sY = k\Delta Y$ or in a more familiar expression,

$$\Delta Y / Y = s/k. \dots\dots\dots 3$$

This equation reveals that the rate of growth of output is determined jointly by the national savings ratio, s, and the national capital output ratio, k. It also says that the growth rate of national income will be directly related to the saving ratio and inversely related to capital output ratio.

In the context of this study, Y in the model represents economic growth while k represents public investment. According to Vision 2035, the savings level of Cameroon is low and stands at 17.4 percent of GDP which is a major hindrance to long term growth and development. The Harrod-Domar growth model suggests that for economic growth to occur, the rate of savings must be positive and rising. Since most developing countries have a negative attitude towards savings, they always resort to borrow in order to complement the domestic savings for economic growth. Since savings in Cameroon is low, the Harrod-Domar model sees borrowing to be complementary to domestic savings which is seen as an engine to economic growth.

In other to situate this paper within relevant context, the following peer reviews are consulted, stating with: Atique and Malik (2012) show the existence of an inverse relationship between domestic debt and economic growth and between external debt and economic growth in Pakistan. Kharusi and Ada (2018) also find that external debt has a negative significant effect on economic growth in Oman. Their findings are similar even though with use of different

methodologies. Furthermore, Onakoya and Ogunade (2017) conducted a research and found that external debt is negatively related to economic growth. In like manner, Ogunmuyiwa (2011) using Vector error correction Method (VECM) show that there is no strict causality between external debt and economic growth in Nigeria

Asghar (2016) found that economic growth is significantly explained by external debt in a time series study carried out in Pakistan. Also, Elwasila (2018) in Sudan, find a positive effect of external debt on economic growth. Furthermore, Saifuddin Md (2016) using Two Stage Least Square as an estimation technique show that public debt positively affect economic growth in Bangladesh.

Using both fixed effects and system General Method of Moments (GMM) to estimate data collected from 55 low-income countries that are classified as eligible for the IMF's Poverty Reduction and Growth Facility (PRGF). Benedict et al (2003) observed that, beyond a certain limit, higher external debt is associated with lower rates of growth of per capita income. The data used in this study cover a period of 29 years (1970–99). Meanwhile Mahmud and Shahida (2012) found a significant long run negative effect of external public debt service in Bangladesh.

Servicing higher external debt as a result of growing external debt stock consumes much of the fiscal revenues and leaves lesser revenue with the fiscal authorities to run the economy. Hence, developing countries in order to meet up with this gap, either try to borrow more resources from abroad to maintain economic stability or cut down their capital expenditure, which in turn affect the economic growth. To validate this hypothesis, Shabir (2013) used linear panel data from a sample of 70 developing countries for 36 years (1976 – 2011) and obtained results which show an inverse relationship between external debt to GNI and growth rate of per capita GNI for the developing countries.

Like Ndubuisi (2017) who found a positive significant effect of external debt stock on Nigeria's growth index, Abuzaid (2011) in analyzing the impacts of external debt and debt services on growth and investment in three selected Arab countries Tunisia, Egypt and Morocco using two equations confirmed that, external debt affect growth directly. Also, the results indicate that external debt affects investment positively and is statistically significant.

Bernardin et al, (2018) examines the effect of external debt on economic growth in Sub-Saharan Africa (SSA) in view of an upsurge in the level of external debt in many countries on the continent. They concluded that, external debt negatively affects economic growth in SSA. In the same manner, Ncanywa and Masoga (2018) arrive at the conclusion according to which public debt is inversely related to economic growth.

Onakoya and Ogunade (2017) conducted a research and found that external debt is negatively related to economic growth. In like manner, Ogunmuyiwa (2011) using Vector error correction Method (VECM) show that there is no strict causality between external debt and economic growth in Nigeria

Njimanted *et al* (2015) used the system estimation approach in a study on "External debt, Domestic investment and economic growth" in Cameroon over the periods 1980 to 2013. Using Two Stage Least Square as an estimation technique, the results they obtained revealed that external debts adversely affect economic growth in Cameroon.

Much has been said under this topic since many have written under this area of external debt and economic growth with different results arrived at. It imperative to note that external debt left on its own without operating through other variables cannot bring about economic growth, but it must operate through other variables to produce the required result. This study looks at public investment as one of the mediums through which external debt operates to produce the required result.

3. Research Methods

This paper adopts the causal research design because it plays an instrumental role in terms of assessing the impacts of changes in existing norms and processes. The data used are quantitative in nature and are secondary. The adoption of a causal research design is justified by the fact it allows for the investigation of the cause and effect relationship between the variables of interest.

Three economic growth multivariate models are specified to determine the relationship and to address all three specific objectives of the paper.

The first model of this paper examines the effect of external debt (XDEBT) on economic growth. Econometrically specification as follows:

$$GDPPC_t = \beta_0 + \beta_1 XDEBT_t + \beta_2 PINV_t + \beta_3 DCPS_t + \beta_4 BMON_t + \beta_5 EXP_t + \beta_6 LFP_t + \beta_7 FDI_t + \varepsilon_t \dots \dots \dots 1$$

The second objective of the paper investigates the effect of public investment (GINV) on economic growth. The econometric model to address this second objective is formulated as follows:

$$GDPPC_t = \alpha_0 + \alpha_1 GINV_t + \alpha_2 PINV_t + \alpha_3 DCPS_t + \alpha_4 BMON_t + \alpha_5 EXP_t + \alpha_6 LFP_t + \alpha_7 FDI_t + \mu_t \dots \dots \dots 2$$

In order to examine the modulating effect of public investment on external debt on economic growth in Cameroon, the following model with interaction variable between external debt and public investment (GINV*XDEBT) is thus specified as:

$$GDPPC_t = \gamma_0 + \gamma_1 XDEBT_t + \gamma_2 GINV_t + \gamma_3 GINV_t * XDEBT_t + \gamma_4 PINV_t + \gamma_5 DCPS_t + \gamma_6 BMON_t + \gamma_7 EXP_t + \gamma_8 LFP_t + \gamma_9 FDI_t + \vartheta_t \dots \dots \dots 3$$

GDPPC is per capita GDP which is used here as a proxy for economic growth, XDEBT is external debt, GINV is public or government investment, PINV is private investment, DCPS is domestic credit to the private sector, BMON is broad money which captures money supply, EXP is exports, LFP is labour force participation rate, FDI is foreign direct investment, ε_t , μ_t and ϑ_t are the disturbance terms which is assume to follow a normal distribution.

GDP per capita is included in the model because it is a better measure of economic growth while external debt on its own cannot produce the required result. Thus, public or government investment is the mechanism through which external debt operate to produce the expected result. With the inflow of foreign capital in the form external debt, broad money increases and as such it is imperative to see how it affects economic growth. With all these in play, exports are supposed to increase and the increase in exports supposed to correlate with growth. All these variables cannot operate without the participation of labour force.

Assuming a log-log model, we interpret the coefficients as elasticities. In this context, equations 1, 2 and 3 become equations 4, 5 and 6 respectively as:

$$LGDPPC_t = \beta_0 + \beta_1 LXDEBT_t + \beta_2 LPINV_t + \beta_3 LDCPS_t + \beta_4 LBMON_t + \beta_5 LEXP_t + \beta_6 LLFP_t + \beta_7 LFDI_t + \varepsilon_t \dots\dots\dots 4$$

$$LGDPPC_t = \alpha_0 + \alpha_1 LGINV_t + \alpha_2 LPINV_t + \alpha_3 LDCPS_t + \alpha_4 LBMON_t + \alpha_5 LEXP_t + \alpha_6 LLFP_t + \alpha_7 LFDI_t + \mu_t \dots\dots\dots 5$$

$$LGDPPC_t = \gamma_0 + \gamma_1 LXDEBT_t + \gamma_2 LGINV_t + \gamma_3 LGINV_t * XDEBT_t + \gamma_4 LPINV_t + \gamma_5 LDCPS_t + \gamma_6 LBMON_t + \gamma_7 LEXP_t + \gamma_8 LLFP_t + \gamma_9 LFDI_t + \vartheta_t \dots\dots\dots 6$$

Where β_1 to β_7 , α_1 to α_7 and γ_1 to γ_9 are the coefficients of LGINV, LXDEBT, $L(GINV * XDEBT)$, LPINV, LDCPS, LBMON, LEXP, LLFP and LFDI that is giving the percentage change in GDP per capita resulting from a unit percentage change in one of the explanatory variables holding any other variable constant. α_0 , β_0 and γ_0 are the constant term which can be considered here as the natural rate of economic growth in Cameroon.

For estimation of the parameters of the models specified, the Dynamic Ordinary Least Squares (DOLS) estimation technique was used. In fact, one of the key and strong assumptions of OLS estimation technique is the absence of correlation between the residuals and the explanatory variables ($Cov(\varepsilon_t, x_t) = 0$). When this assumption is violated, the estimated parameter is bias and inconsistent, leading to a spurious regression. When it is postulated that there may be a significant correlation between the explanatory variable and the error term, this explanatory variable is no longer considered to be exogenous but rather endogenous. This problem is known in the econometric jargon as the problem of endogeneity. This is usually the case in time series data which are not stationary at level and are co-integrated as it is the case in the present study.

In effect, Stock and Watson (1993) showed that due to the fact that a linear combination of the dependent variable and independent variables create a stationary error term then this error term is correlated with the regressors (problem of endogeneity). One and most popular way of addressing this problem is that of using instrumental variables two stage least squares (2SLS). One robust way of addressing this issue of endogeneity without using instrumental variables is the Dynamic OLS approach. The Dynamic OLS involves augmenting a (super consistent) OLS estimate of the co-integrating relationship with first differences of leads and lags of the right hand side (RHS) variable of the model specification (regressors). In this study

our main variables are public investment and external debt. Stock and Watson (1993) proposed that in case of endogeneity of co-integrating variable and small sample bias as it is the case, the Dynamic OLS is preferable.

4. Finding and Discussion

To ensure results were appropriate, stationarity test was conducted since most economic time series variables are non-stationary and the use of non-stationary time series data leads to an apparent but not actually valid regression which implies that it cannot be used for precise decision. Testing for stationarity of the variables used in the models are non-stationary at levels but achieved stationarity after their first difference as seen from the unit roots test (- Augmented Dickey Fuller tests) which therefore implies that all the variable are integrated of first order (I(1)).

Table 1. Dynamic OLS results of determinants of economic growth

VARIABLES	(1) lgdppc	(2) lgdppc	(3) lgdppc
lxdebt		-0.368*** (0.0200)	-3.700*** (0.851)
lginv	0.211*** (0.0268)		-2.966*** (0.736)
lginv_lxdebt			0.138*** (0.0321)
lpinv	-0.0184 (0.0170)	0.230*** (0.0309)	0.0500** (0.0244)
lbmon	0.199*** (0.0403)	0.0336 (0.0280)	0.238*** (0.0265)
dcps	0.00601*** (0.00109)	0.00186 (0.00155)	-0.00130 (0.00167)
lexp	-0.0726*** (0.0243)	0.210*** (0.0618)	-0.0448*** (0.0138)
lfp	0.0115*** (0.00115)	0.0957*** (0.00635)	0.0380*** (0.00799)
lfdi	-0.00496*** (0.00184)	0.0151*** (0.00556)	0.00203 (0.00404)
F3D.lginv	0.0644*** (0.0228)		0.0338 (0.0234)
F2D.lginv	0.0306 (0.0324)		-0.0213 (0.0262)
FD.lginv	0.175*** (0.0262)		0.0912*** (0.0186)
D.lginv	-0.0358** (0.0173)		-0.0248 (0.0199)
LD.lginv	0.00666 (0.0168)		0.0703*** (0.0139)

VARIABLES	(1) lgdppc	(2) lgdppc	(3) lgdppc
L2D.lginv	0.0916*** (0.0216)		0.0678*** (0.0107)
L3D.lginv	0.0542** (0.0224)		0.0481*** (0.0153)
F3D.lxdebt		0.0561*** (0.0196)	0.0594*** (0.0202)
F2D.lxdebt		-0.0396*** (0.0153)	-0.00313 (0.00813)
FD.lxdebt		-0.0222 (0.0148)	0.0318*** (0.00408)
D.lxdebt		0.331*** (0.0275)	0.115*** (0.0278)
LD.lxdebt		0.410*** (0.0225)	0.146*** (0.0448)
L2D.lxdebt		0.215*** (0.0220)	0.0401*** (0.00995)
L3D.lxdebt		0.155*** (0.0213)	0.0666*** (0.0244)
Constant	8.724*** (0.914)	1.333 (0.992)	89.09*** (19.05)
Observations	32	32	32
R-squared	0.992	0.974	0.996

Note: Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: Computed by authors (2021)

All three models are globally significant at 1% given a probability value of χ^2 (Prob > $\chi^2 = 0.0000$) which is below 0.01 and, between 97.4% and 99.6% of variations in economic growth in the long run is explained by a joint variation of all the regressors included in the model.

Results from Table 1, indicate that the coefficient of public investment is positive (0.211) which implies that there is a positive long run effect of public investment on economic growth in Cameroon. In effect, an increase of government or public investment by one percent will lead to an increase in GDP per capita by about 0.21% everything being equal in the long run. It should be noted that this result is significant at 1% level. Thus there is a positive and significant effect of government investment on economic growth in Cameroon in the long run. This result is in line with a priori expectation and confirms the Barro (1990) model of endogenous growth which posits that proper and quality government spending geared towards infrastructure development will result in economic growth. This result also confirms the Keynesian theory of economic growth, which acknowledges investment, especially public investment, as the main driver of economic growth through the multiplier effect. If public investment is carried out to improve the quality of infrastructure, this will reduce the cost of

private investment and increase the return to investment and by so doing spur economic growth. This result is in conformity with the finding of Ouattara (2004) who found a positive effect on government investment on economic growth.

Column 2 of Table 1 indicates that the coefficient of external debt is negative (-0.368) meaning that external debt relates negatively with economic growth measured by per capita GDP in the long run in Cameroon. A unit percentage increase in the total external debt stock by one percent will result in about 0.37% fall in economic growth *ceteris paribus*. This finding is significant at 1% level. This outcome confirms the debt overhang hypothesis which indicates that accumulated debt stock reduces economic performance through what the proponents of this theory called “debt overhang” effect including tax disincentive especially on private sector investment as macroeconomic instability signals. This hypothesis makes it clear that with very high level of external debt, the government has no incentive to carry out macroeconomic reforms and good policies as such the prevalence of poverty. Since the return of these reforms will only be used to repay outstanding debt. This result is in line with the findings of Bernardin et al, (2018), Njimanted et al. (2015) and Atique and Malik, (2012) who found a negative effect of external debt on economic growth, but contradicts the finding of Elwasila (2018) in Sudan who rather found a positive relationship between external debt and economic growth.

When taking into consideration the possible modulating effect of public investment on the effect of external debt on economic growth (Column 3), results reveal that there is positive modulating effect of public investment on the effect of external debt on economic growth in Cameroon in the long run given that the coefficient of the interaction variable between public investment and external debt is positive whereas the coefficient of external debt and public investment are negative. More precisely, results from the DOLS, show that the negative effect of external debt on economic growth is significantly watered down by public investment. This finding is significant at 1% level. Thus, there is a significant positive influence of public investment on the effect of external debt on economic growth in Cameroon in the long run. . This positive modulating effect conforms to the finding of Ncanywa and Masoga (2018) who also found that public investment could help mitigate the negative effect of external debt on economic growth. This finding therefore shows that, if the external debt is properly used to create favourable conditions for private investment such as constructing road, hospitals, schools and training centres, improving on the communications network and other transport facilities, this will go a long way to improve on the effectiveness of external debt on less developed economies such as Cameroon.

Going by the control variables, results reveal that there is a positive and significant relationship between private sector investment and economic growth in Cameroon. In other words, the higher the level of investment by the private sector, the higher will be the level of gross domestic product in Cameroon. This result conforms to our prior expectation and falls in line with the result of Kongphet and Masaru (2012), who found a positive relationship between investment and economic growth. Higher level of investment by the private sector may translate into more employment and more income to the population due to remuneration of factors of production.

In addition, money supply measured by broad money consistently exerts a positive effect on economic growth given that the coefficient of broad money (BMON) is positive across all the specifications. This result signifies that an increase in money supply will bring about an

increase in per capita gross domestic income in the long run. This result is significant at 1% level in Columns 1 and 3, but insignificant in Column 2. Thus, money supply is relevant for policy recommendations aimed at improving the economic growth in Cameroon. This confirms with Prasert Chaitip et al. (2015) who found that money supply were associated with economic growth.

Similarly, the coefficient of domestic credit to the private sector (DCPS) is positive in Columns 1 and 2 but negative in Column 3 - implying a positive effect of credit availability or financial development on the economic growth. But when accounting for the modulating effect of public investment on external debt, this effect is reversed. However, it should be noted that only the coefficient of DCPS in Column 1 is statistically significant. This result is in accordance with Olowofeso et al (2015) who confirmed a positive and significant effect of private sector credit on output.

Further results reveal that there is a consistent positive and significant effect of labour force participation (LFP) on economic growth. The coefficients of LFP are positive across all three specifications and significant at 1% level. On average, an increase of labour force participation by one percent will result in about 0.04% increase in per capita income in Cameroon everything else held constant. The result obtained at this level is contrary to Shahid (2014) who found that labour force participation has negative significant effect to economic growth.

5. Conclusion

The result did not confirm a positive relationship between external debt and growth. Thus, there is a negative significant relationship between external debt and growth in the long run. Investment is a vital ingredient of economic growth to less developed countries; the coefficient of public investment is positive and has a statistically significant effect on economic growth in the long run. This means that a substantial part of the country GDP has been invested and that helped her to grow quickly. A significant influence of public investment on the effect of external debt on economic growth was established in the result. The moderating effect of public investment on external debt to economic growth was found to be significant and positive. This indicates that public investment influences external debt positively on economic growth. This implies that public investment change the negative effect of external debt on economic growth to positive.

Based on the empirical findings, the following policy outcomes are proposed:

The governments should ensure that the foreign loans are invested in projects that would eventually generate enough returns to amortize the debt. Also, enhancing domestic revenue mobilization will go a long way to reduce over reliance on external financing. In this regard, there is the need to embark on efficient revenue mobilization drives through the broadening of tax base, devising various strategies to capture untaxed informal sectors into the tax net and check revenue leakages so as to increase domestic revenue mobilization.

For debt to promote growth in Cameroon, fiscal discipline and high sense of responsibility in handling public funds should be the watchword of the leaders.

Furthermore, the government should increase the effective and appropriate utilization of external resources by investing in selected productive investment including basic infrastructural developments that facilitate the productivity of other sectors of the economy.

Also it is suggested that governments should pay more attention to proper debt management, to items of expenditure and try to direct it to productive use. The government should cut down the contraction of new debts while investing the already contracted debt as well as debt relief funds in the real sector of the economy.

Investments should be directed in real sectors of the economy such as the agricultural, infrastructure, industrial, education, energy and health which will act as catalyst for the national development.

Investment in education should be encouraged given that the coefficient of labour force participation is positive and significant in the long run. Education that provides the technical know-how should be encouraged as this contributes significantly to the growth of the economy. As such, investment in technical education, creation of Universities for science and technology throughout the national territory alongside polytechnics are strongly recommended.

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Implementation of GASING Stock Gamification to Increase Financial Literacy for High School Students

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Abstract

Financial inclusion played an essential role in increasing the nation's welfare. Therefore, it is crucial to increase financial literacy since the literacy index in Indonesia is still 38,03%. Stock market investment had the lowest contribution toward the level of literacy index. The advancement of ICT and the penetration of internet users support the spreading of financial information among the young generation. Due to its low literacy rate, Indonesians are still vulnerable to false financial information, leading to investment fraud. Gamification is chosen as an alternative method in taking advantage of interactive game development that can easily download via smartphone. The gamification system design, which is named GASING, gives the younger generation adequate information related to secure financial investment. The target game user of GASING is high-school students. The feature of the GASING that offer attractive UI/UX design was expected to increase the knowledge of high-school students in learning stock investment. The usage of GASING gamification was also expected to increase more young generation participation in the Indonesian capital market while simultaneously increasing their knowledge, skills, and confidence in the stock market.

Keywords: Financial Literacy, Stock Gamification, GASING, High-School Students

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1. Introduction

According to Financial Services Authority (*Otoritas Jasa Keuangan=OJK*), Financial Inclusion Index is defined as the availability of access to various financial institutions, products, and services by the needs and capabilities of the community to improve the welfare of the community. Finance literacy is one of the dimensions of financial inclusion. Financial Literacy Index refers to knowledge, skills, and beliefs that influence attitudes and behaviour to improve the quality of decision-making and financial management to achieve prosperity (Natalia et al., 2020).

According to Financial Inclusion Index data, financial institutions, services, and products are now more accessible to the public than in 2016. The figure stood at 67.8% in 2016 and has improved to 76.19% in 2019. Despite this, the Financial Literacy Index results for 2019 show

that knowledge, skills, and beliefs are still far too low at 38.03%. We can conclude that even though 76.19% of institutions, services, and products are available to the public, the knowledge and skills associated with them are lacking.

The advancement of ICT technology has played an important role in supporting the government program to increase Indonesian financial literacy. Technology has become an integral part of today's society, including in the financial and investment sectors. It has become easier to locate information and to gain access to it through different forms of investment. However, there are disadvantages as well. Much false information and investment fraud circulate through the internet. The situation is made worse by the pandemic, while on the economic front, people are more demanding. In the absence of knowledge and skills, information tends to be accepted without scrutiny, leading to abusive behaviour by some irresponsible parties. To induce the target to invest in the no-risk type, parties use propaganda to manipulate their target's feelings. Propaganda manipulates readers' feelings by using both positive and negative emotions to trigger a sense of calmness to confuse the target and enforce a feeling of trueness (Ghanem & Rosso, 2020).

According to *Satgas Waspada Investasi (SWI)*, Indonesians have been swindled out of 117.4 trillion Indonesian Rupiah over the last decade due to fraudulent investment practices. The highest loss caused by fraudulent investments occurred in 2011, absorbing up to 68.62 Indonesian Rupiah trillion funds. In 2019, the perpetrators managed to get their hands on 4 trillion Indonesian Rupiah. It has 442 illegal investments, 1.493 illegal financial technology (fintech) loans, and 68 illegal pawns.

Meanwhile, the number of Indonesian investors keeps on increasing year after year. As of September 2021, there are 6.4 million investors compared to 3.8 million investors in 2020, which shows a significant increase of 65.73%. KSEI statistics show that 59.23% of investors are under the age of 30, indicating that Generation Z investors represent the majority of investors, representing most of them being high school students. Generation Z is classified at the age range of 17 years old up to 29 years old. Generation Z intended to focus on short-term investments that would bring higher returns than long-term financial instruments (Yanto et al., 2020). Generation Z tends to have a sense of flow from social networks where everything changes swiftly. They also tend to perceive only brief, visual information. In the multitasking mode, they feel very confident but focusing on finishing a task requires tremendous effort (Matraeva et al., 2019). This may lead to a short-term - trading type of investment with no in-depth research/analysis, which may also give an advantage to the fraud doers.

To increase investment in Indonesia, the Indonesian government has launched a movement called 'Yuk Nabung Saham' since November 15, 2015. With this movement, the society aims to become as knowledgeable about the capital market as soon as possible, which is at 17 years of age (Ramadhani, 2021). In conjunction with financial literacy support from the ministry of education and culture, which supports education about financial literacy since early stages. The movement has resulted in investors growing to 4.5 million capital market investors from 0.4 million at the end of 2015 (KSEI, 2021).

The capital market itself has a bad reputation in society, where investment in the capital market is viewed as a gamble. Furthermore, investment fraud has increased since the pandemic in Indonesia, where it offered high returns without a risk that attracts investors. Through OJK (2021), the government has encouraged investors to learn about the legality of an investment

before investing in an instrument product. Additionally, OJK uses digital platforms to continue educating investors about secure investment in the stock market. Digital platforms, including gamification, was chosen since it attracts the younger generation.

Alshowaier (2018) defines gamification as a method that turns non-game context into an application of video games to increase engagement and motivation in learning. It is an innovation considering the game culture spreading all around the world. In correlation with stock, gamification turns stock market education into a form of the game. It stimulates and educates people about the stock market in the interactive way of a game, so more people are learning about the capital market.

The usage of the stock gamification was expected to increase the financial literacy related to stock market investment among high school students. This interactive Android-based game application offered simplicity and convenience since it is accessible anywhere through the smartphone. The game was educational since it gave trading simulation that could be played interactively and brought an enjoyable experience. Once the high-school students are familiar with the stock market concept, they will be interested in learning more and finally will become stock market investors.

2. Literature Review

2.1 Financial Literacy and Financial Knowledge

Financial knowledge is defined as the ability to calculate financial information, such as inflation, interest rates, and risk and returns (Kadoya & Khan, 2020). It progresses into the ability to control one's financial conduct and mindset. A financially educated person should understand basic financial concepts such as lending and borrowing, insurance, investments, and savings and have a favourable attitude regarding personal finances (Nano, 2015). People are discovering that financial literacy is a necessary skill. Financial knowledge is one of few important determinants to examine financial literacy (Rai et al., 2019).

2.2 Stock Investment

The aim of individual investors in choosing stocks is projected into investor behaviour in stock investment decision-making. Individual investors' objectives are reflected in stock return estimates based on various analyses (Pahlevi & Oktaviani, 2018). Fundamental and technical analysis are two methodologies often used to assess and predict financial market activity. The first method examines the economic factors that may impact market movements and is best suited for longer-term forecasting. On the other hand, the technical analysis considers that the price already incorporates the fundamentals that influence it (Cavalcante et al., 2016).

2.3 Gamification

Gamification is a method that turns non-game context into an application of video games (Alshowaier 2018). Therefore, it can motivate and engage a person more in non-game contexts like stock market education. Gamification itself impacts positively on social present and sense (Antonaci et al., 2019), even though the research only shows a partially correlated relationship between social present and sense and engagement. A study by van Roy and Zaman (2018) also found that those game elements affect the motivation factor in gamification, although the motivational impact depends on the person.

3. Research Method: Gamification System Design (GASING)

GASING is a simulation learning game intended for beginners, exceptionally high school students. GASING was developed to support the IDX program to educate high-school students and introduce the stock market investment. The game's idea is to replicate stock trading in an interactive, educational, and entertaining way. The game's goal is to reassure players that stock trading/investment is a safe investment instrument as long as an investor has a piece of adequate financial knowledge before making a financial investment. Players will also understand stock terminology and analytical techniques, allowing them to weigh the risk and return of stock investment. GASING system development is built using the Unity program. This game itself mainly consists of three levels.

- **GASING Main Menu**

The main menu of this game displays the GASING logo and also the button to start game.

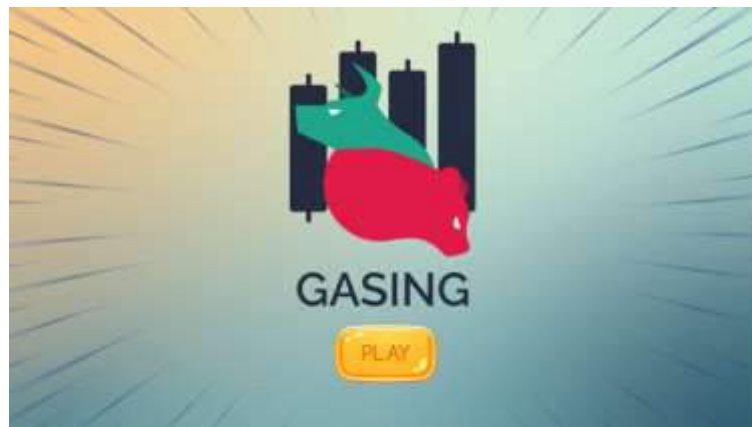


Figure 1: GASING Main Menu

- **Introduction Menu**

After clicking the start menu button, it will continue to the introduction menu, where it is explained about the mechanism of the game and in-game goals. Furthermore, the user can decide their investor profile, including name, age, job, and avatar.

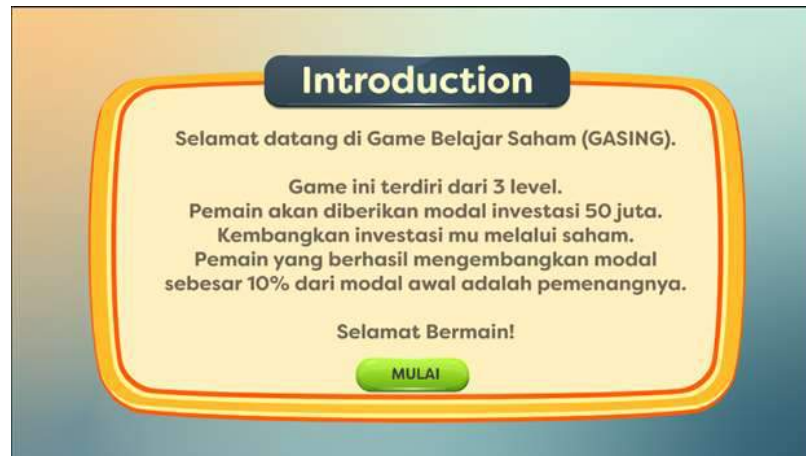


Figure 2: GASING Introduction Message



Figure 3: GASING Investor's Profile

- **GASING Level**

Level 1

In the first level, it will introduce related capital market institutions where the player will enter 3 buildings that will explain the institution's job in the capital market. After that, a quiz will reward money to buy stock in the second level.

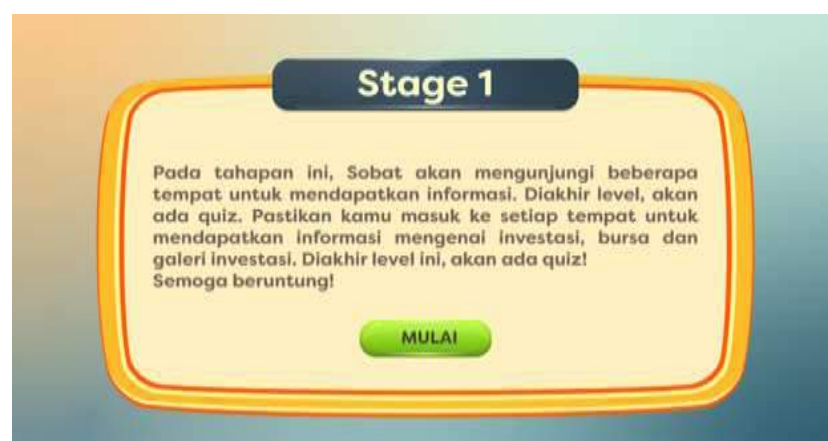


Figure 4: GASING Stage 1 Message



Figure 5: GASING Stage 1



Figure 6: GASING Stage 1 Philip Sekuritas Indonesia

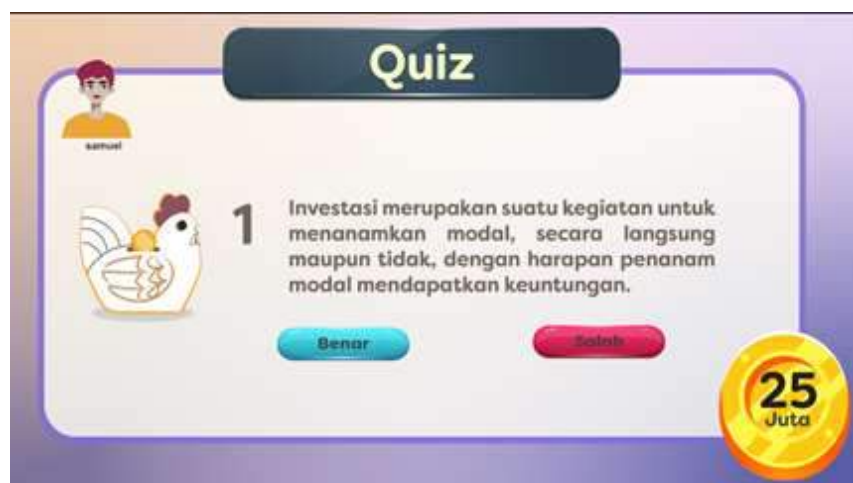


Figure 7: Quiz 1

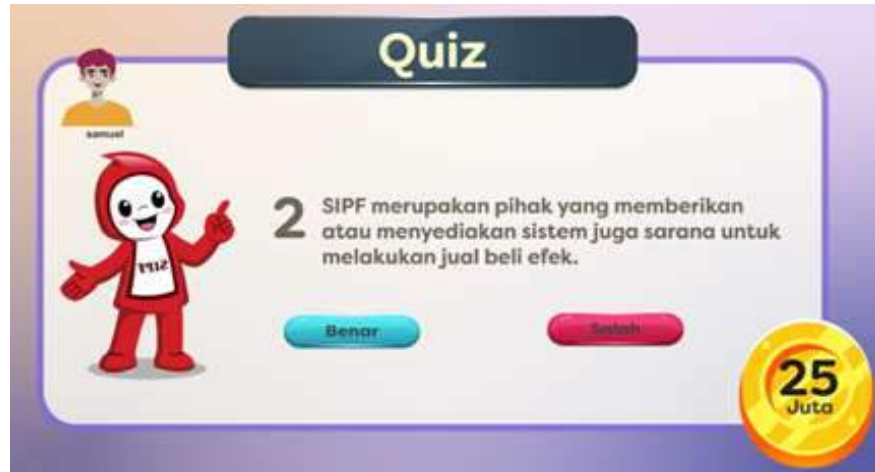


Figure 8: Quiz 2

Level 2

The player will learn the stock market mechanism in the second level and dive into the stock market simulation. Players can simulate buying and selling 18 types of stocks for 15 minutes. Stock price changes are made every 2 minutes. When the player gets a profit above 10% of the initial capital of 10 million rupiahs, the player plays to level next. If not, it will repeat at level 2.

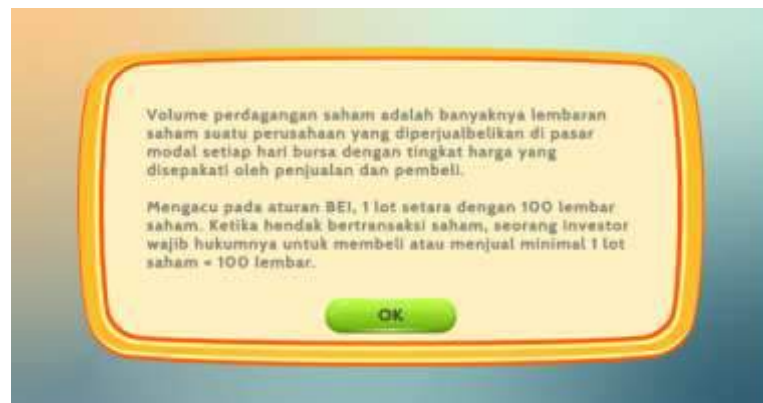


Figure 9: GASING Stage 2



Figure 10: Stage 2 Stock Options



Figure 11: Stage 2 Stock Options Description

Level 3

In the third level, the player will simulate stock trade following the real market. The stock price displayed at this level is a real-time price based on the IDX-Indonesia Stock Exchange with several stock lists that can be chosen.

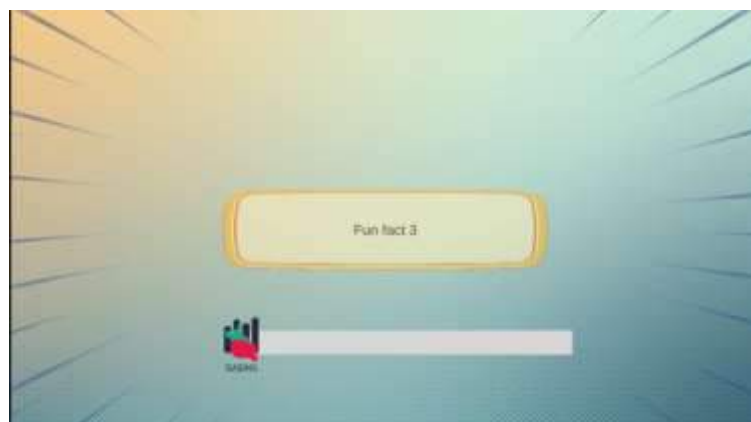


Figure 12: Loading Screen

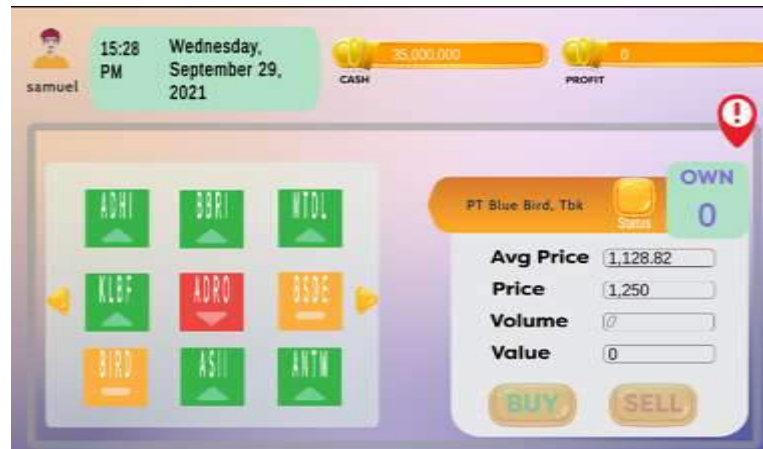


Figure 13: Stage 3 Stock Options



Figure 14: Stage 3 Stock Options Description

4. Implementation of Gamification System Design: GASING

A study conducted by Brown & Russel (2019) found that gamification can increase the learning capabilities of the students (Azani et al., 2019). Therefore, the GASING gamification is also expected can fulfil educational purposes by having the following elements:

1. Points: to measure the success level of each high-school student gamer. Points element would also increase the enthusiasm to achieve the targeted level.
2. Levels/stages: to give sensation for game advancement among high-school student gamers.
3. Medal: as an appreciation for finishing the tasks.
4. Leaderboard: to keep the high-school student gamers motivation to increase their achievement.
5. Prizes: an effective way to motivate high-school student gamers.
6. Storyline: to assist high-school student gamers more interested with the game flow in order to finish the educational process.

Following is the stages in designing and releasing GASING using the Game Development Life Cycle (GDLC) method (Dicheva, 2015):

1. Initiation: by collecting data to set up the needs of the high-school student gamers as references. Initiation is an early stage in which observation, interview and surveying by distributing questionnaires was used to get the needs and requirements of the gamers.
2. Pre-production: a process in designing the GASING game application, starting from making GASING Game Design Document, then designing the system to run the application.
3. Production: started with the making and collecting GASING game asset and making program.
4. Testing: After the production process is finished, the testing process is conducted in an internal team using black-box testing.
5. Beta: after internal testing, GASING game application will be tested to beta testers.
6. Release: After the testing application showed that the game is running well, the GASING game is ready to introduce and published to high-school students as the primary target users.

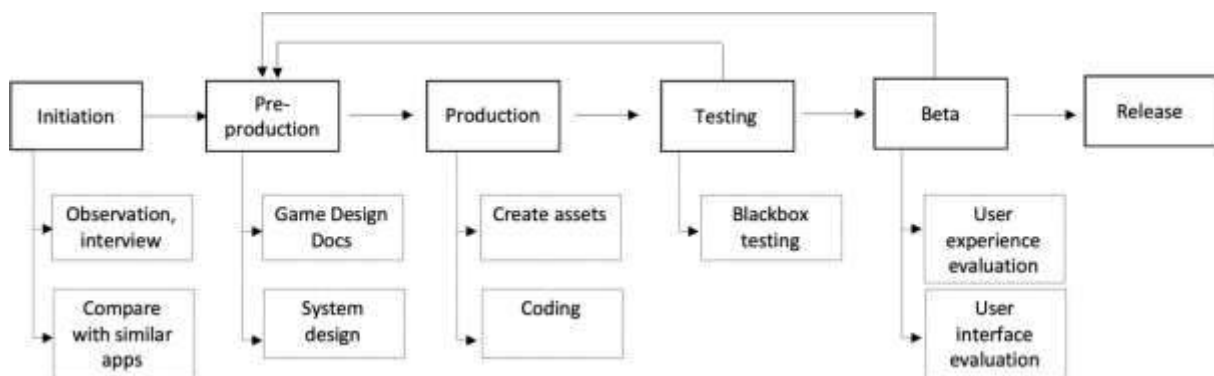


Figure 15. GASING Game Development Life Cycle

5. Conclusion

The research still has a limitation in the effective measurement of gamification in the education of the stock market since this gamification model is still new and released. In addition, the effects of gamification toward engagement and motivation in education so far need further study. Hence, to measure the effectiveness of gamification in the stock market, it might be suitable to use the download data from GASING from the Google Play Store to measure high school students' interest in investment. In addition, a further survey regarding the knowledge, engagement, and increase of SID can be an option to measure the effectiveness of gamification in the stock market. In conclusion, the effectiveness of gamification in stock market education needs more research. However, it is hoped to affect the stock market education positively.

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Obstacles of Implementing Industry 4.0 in Nepalese Industries and Way-Forward

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Abstract

Industry 4.0 is buzzword in recent years and has become a topic of growing importance. It is a new technical framework that has been widely debated and studied and is likely to eventually constitute a fourth industrial revolution because it provides significant progress relevant to intelligent and potential industries in the market. As Nepal has introduced open policies for improving trade conditions in the mid-1980s, industries have to be competitive and capable enough to sustain themselves in such open policies. Such, dependencies can be minimize, and could only be possible, through the increasing the competitiveness of Nepalese industries with the help of use of new technologies. In such context, Nepalese industrial readiness for industry 4.0 is important topic to discuss. This study aims to identify the obstacles of implementing industry 4.0 in Nepalese Industries lies within 3 industrial estates of Kathmandu Valley i.e. Balaju, Patan and Bhaktapur industrial estates. Data has collected data from all 287 running industry from all three industrial estates with the help of questionnaire through respondent interview using KoBo Collect Toolbox. Our study finds that half of the industries (49%) face hurdles while adopting new technologies. Among them, the major hurdles are lack of infrastructure, lack of skilled manpower, lack of capital, poor implementation of policies. Among two third of the respondents think obstacles in implementing industry 4.0 is manageable. Political support, improvement in implementation mechanism and long term strategy are key factors that support industries to invest in new innovative technologies.

Keywords: Industrial Estates, Industry 4.0, Obstacles, Kathmandu Valley, Nepal

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1. Introduction

In recent years, the word "Industry 4.0" has become a topic of growing concern (Morrar et al, 2017; Kamble & Gunasekaran, 2018; Rajbhandari et al., 2020). This idea was first published in the German government in November 2011 as a part of a High Technology Strategy Plan for 2020 (Zhou, Liu, & Zhou, 2016). The global industrial scenarios are changing dramatically in recent years, only due to the innovation and developments in manufacturing

processes (Yang & Shyu, 2009; Pereira & Romero, 2017). Over recent years, numerous new global trends have arisen with the growing advancement over production processes and technologies (Mourtzis, 2020). Industry 4.0 can be tentatively linked to three revolutions in recent centuries which are the latest transformative productivity shifts arising from multiple technological developments (Schmidt, Möhring, Härting, Reichstein, Neumaier, 2015). The heart of every industrial revolution is increased productivity (Rajbhandari et al., 2020).

Industry 4.0 is a new technical framework that has been widely debated and studied and is likely to eventually constitute a fourth industrial revolution because it provides significant progress relevant to intelligent and potential industries in the market (Schneider, 2018). The new concept of industry 4.0 is the cornerstone to new industrial model that covers a range of industry technologies including cyber-physical systems (CPS), the Internet of things (IoT), Internet of services (IoS), robots, big data and cloud computing (Schuh et al., 2014). The new approach brings digital and physical environments together through CPS technologies, opening up a range of potential markets that will allow the businesses embracing the new production model to increase productivity and efficiency (Zhou et al., 2016). Industry 4.0 has tremendous potential, and through the structural change in terms of organization and market modals and manufacturing technologies, it will generate a variety of economic and social opportunities (Kagermann, Wahlster, & Helbig, 2013).

Nepal introduced open policies for improving trade conditions in the mid-1980s, reducing external dependence and creating jobs, but failed to achieve the aforementioned aims. Nonetheless, that dependence on foreign markets to satisfy the rising need for capital goods and intermediate inputs was an obstacle to the growth of manufacturing because of the capital-intensive existence of the IS industries. Since late 1950s, Nepal has carried out regular economic plans (Rajbhandari et al, 2020). However, the low level of mobilization of domestic resources, unsatisfactory external aid payments, and poor project management were primarily attributed to low production capacity, although government spending has been growing (Mainali, 2017; B. K. et al., 2020). Nepal is 119th out of 135 countries in the Sustainable Industrial Performance Index (CIP). According to Economic Survey (2018) the number of industries was 7832.

Out of these registered industries, Two-thirds of the industries are recorded in Bagmati Province and lowest in Karnali Pradesh until mid-March of the FY 2018/19. This evidence states the slow pace of industrial development in Nepal as well as the weak situation of the industrial sector in Nepal. However various liberalization steps have been introduced, including elimination of import licenses, full Nepalese rupees convertibility, the opening of joint venture financing, FDI arrangement and one window scheme, new foreign Investment, and Technology Transfer Act, etc. This cause increased in dependency of Nepal. Until now, large-scale trade has been owned by foreigners, primarily Indians. Dependency on other nations is like a huddle for Nepal's overall development. Thus, these dependency should minimize and this could be possible through the increasing the competitiveness of Nepalese industries with the help of use of new technologies. From all above evidence, we acknowledge that Nepal's industries are not so much developed. Thus, concerning all rationale in this study is focused to measure industrial readiness for industry 4.0.

This study is further organized as: second section includes methods used, in section three results of the study are highlighted and section four concludes the study.

2. Literature Review

The popular phrase for defining developments towards digitization and automation of the manufacturing environment is Industry 4.0 in recent years. This definition has still not earned much attention in the building industry despite its potential advantages with regard to improvements in productivity and quality. The fact that the far-reaching consequences of the increasingly digital and automated fabrication atmosphere are still relatively unexplored is the basis of this development (Nagy, Oláh, Erdei, Máté, & Popp, 2018; Oesterreich & Teuteberg, 2016). Similarly, Oesterreich & Teuteberg (2016) has mentioned that the adverse effects of wasteful and industrial use and output practices are impossible to manage in a competitive business setting. It calls for significant asset performance improvement across the worldwide economy. Several companies have therefore found opportunities to recycle goods or services and have the quality of the material and power supplies recovered over a longer time period.

In case of German manufacturing industry, established producers have acknowledged that consumers are not prepared to pay high prices for improved quality. As a result, most companies in Germany manufacturing industry customize their production to custom goods and rapidly become marketable. With the advantages of new manufacturing techniques such as Agile Production and Mass Customization, manufacturing companies become interconnected networks, where their key competences are fused together (Keller, Rosenberg, Brettel, & Friederichsen 2014). More specially, Erol et al. (2016); Horváth & Szabó (2019) observed that manufacturers are currently facing significant problems with respect to technological technologies such as the Internet of Things, Cyber Physical Systems or Cloud-based Manufacturing—often referred to as Industry 4.0. Eventually, the growing difficulty at all layers of organizations creates uncertainty as to their respective organization, technologies and plans for developing them. Likewise in the study of Horváth & Szabó (2019), they explained that the today's global economic landscape produces an adverse situation for the operation of economic systems.

With the path and volatile growth of the model set, the recent financial and financial crisis destabilized the global economy and demonstrated a lack of perspective. Countries also pursued a more sustainable model of economic growth to permit them to enter a new path of development, opening up wider opportunities for social well-being and development. This generation is the generation of industry which has significant importance of manufacturing. Industrial revolution like industry 1.0, 2.0 and 3.0 are still arising in industries. The disparity between supply and demand within distribution chains is a constant problem for manufacturing companies (Horváth & Szabó, 2019). Similarly, Oesterreich & Teuteberg (2016) observed the present situation of technologies related to industry 4.0 and to present the different angle view for its implementation. Understanding of relationship between industry 4.0 and sustainable manufacturing contributed by the development of the industry 4.0 through the sustainable manufacturing could help for industries which are adopting innovative industrial technologies (Machado, Winroth, & Ribeiro da Silva, 2019).

Similarly, Erol et al. (2016) observed the readiness of manufacturing industry with regard to implementing industry 4.0 which is significant for government as well as industry as well to implement new innovative technologies. Technologies are rapidly changing and innovating, reason behind the adaptation of new innovative technologies there are several driving forces. Müller et al. (2018) observed opportunities and challenges which are taken as fostering factor

for implementation of industry 4.0 considering different aspect of firm's characteristics such as size, role as provider and user and sector. Though there are also several barriers for implementing industry 4.0. Raj et al.(2019) examine the barriers to implement industry 4.0 in context of developing and developed country which contributes towards managers, government for develop policy as well as students for future research in field of industry 4.0. Industry 4.0 in 2019 relies on eight enabling technologies only(Paulo, Pacchini, Cezar, Facchini, & Mummolo, 2019).

3. Research Methods

3.1 Study Area and Population

The area of this study was Kathmandu valley of Bagmati Province, Nepal. Kathmandu valley is situated between 27°32'13" and 27°49'10" latitudes north and 85°11'31 " and 85°31'38" longitudes to the east and 1300 meters above sea level (Bhandari et al., 2021). The valley covers the entire Bhaktapur district, 50% of Lalitpur and 85% of Kathmandu (Pant & Dongol, 2009; Adhikari et al., 2021). There are three industrial estates in Kathmandu Valley alone — industrial estate of Balaju; industrial estate of Patan and industrial estate of Bhaktapur (Devkota et al., 2020). In order to make use of their true potential, these industrial areas require massive infrastructure rework. The use of new technologies in production process was one of the essential subjects. Therefore, these three industrial estates have been chosen by the researcher as study area.

The total area occupied by Bhaktapur industrial estate was 71.28 ropanies and all land was fully developed, where 35 industries were in operation out of 36. The total area of Patan industrial state was 293 ropanies, 293 of which were well formed ropanies. Similarly, there were 73 ropanies covered by the field of operations. There were currently 118 industries within the district, 118 of which were operating. And Balaju Industrial estate has 670 ropanies out of which 540 ropanies were well developed. There were currently 141 industries in the area, 134 of which were operating industries (Industrial District Management, 2018). This three industrial estates include 295 enterprises, 287 of which operating. For our study purpose, number of population was 287. Thus, we adopted census method to collect data for our study.

3.2. Research Instrument

This study is based on survey questionnaire. Questionnaire allows a broad sample of the research population to include abstract and goal information in an attempt to achieve findings that are also worth mentioning (Abawi, 2013). Kobo toolbox was used to hold and fill the questionnaire. After the data was collected it was analyze with the help of tables and charts.

3.3. Data Collection and Analysis

Data analysis is a method to put together evidence and data to solve the question of the report. The data analysis deriving from data processing and inferences are another essential aspect of the inquiry and conclusions are made. Two sections of the data study contain descriptive statistics and Readiness index for this study. The data analysis includes industrial readiness index for industry 4.0, factor affecting industrial readiness, obstacles while implementing industry 4.0 and managerial solution related to industry 4.0 practices in Kathmandu valley.

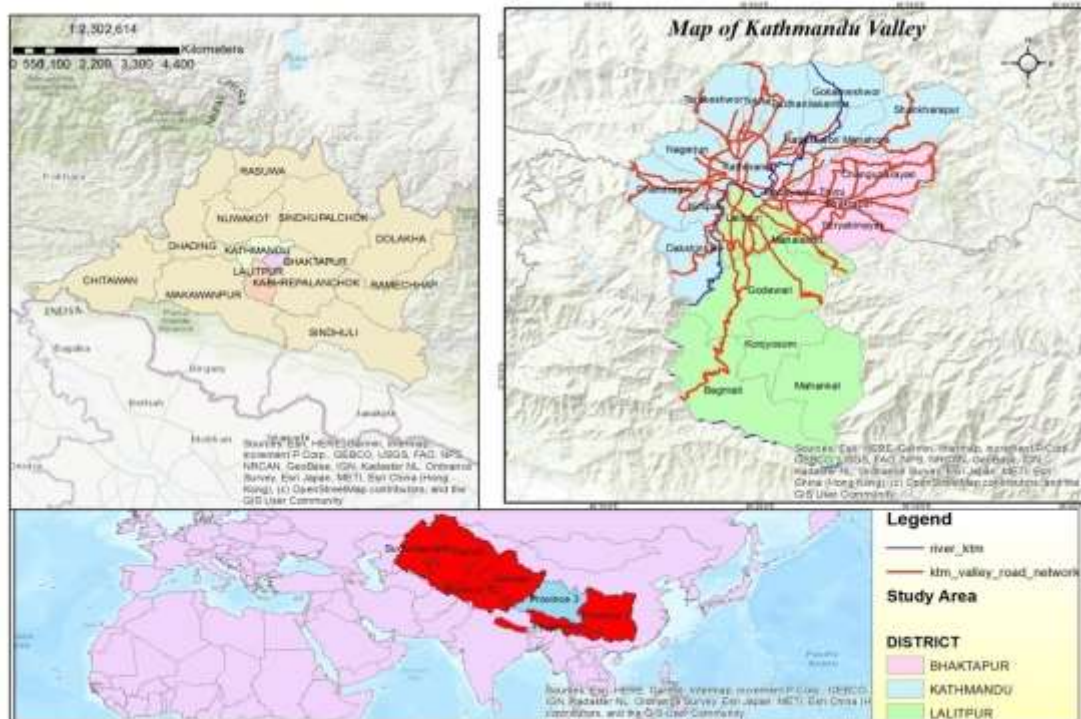


Figure 1: Study Area

The descriptive analysis includes an analysis focused on mean, average, and style and so on. Descriptive research is structured to explain several data properties that are typically analyzed. For the ranking of the readiness level, Readiness degree table was stated, which is developed by (Paulo et al., 2019).

Table 1: Degree of Readiness

Degree of Readiness (DR)-%	Status	Characteristics
$0 < DR < 10\%$	Embryonic	The firm knows a limited range of activated innovations superficially (if any).
$10 < DR < 25\%$	Initial	Some innovations are known to the organization but not all of them can be known.
$25 < DR < 50$	Primary	All developments are well known to the Organization, but not all have already been implemented.

50<DR<75%	Intermediate	The business understands all innovations and it all started to be applied.
75<DR<90%	Advance	The business has full understanding and a high degree of acceptance of all technology
90<DR<100%	Ready	Almost all the activated innovations are completely embraced by the organization.

Source: Paulo et al. (2019)

4. Results and Discussion

4.1. Obstacles of Implementing Industry 4.0

49% industries revealed that they have hurdles while adopting new technologies. However, other 51% of industries were not having any hurdles in adopting new technologies, because of low use or non-use of technologies in industrial process. Figure 3 demonstrates that there are several challenges or hurdle while adopting new technologies. The major hurdles are lack of infrastructure, lack of skilled manpower, lack of capital, poor implementation of policies and others. Figure 3 shows 14% hurdles arrive due to lack of infrastructure in industries. Similarly, 24% of hurdles occur due to lack of skilled manpower for operation of new technologies.

Industrial representatives also mentioned that, the challenges or hurdles while adopting new technologies were occurred due to Government agencies like custom, labor union, political parties, pressure group, and local youth clubs. It was observed that almost half of the hurdles were due to government agencies. Similarly, labor unions were also creating hurdle while adopting new innovative technologies. Furthermore, 15 % of challenges occurred due to political parties and remaining 18% of challenges occurred due to other stakeholders.

4.2. Managerial Solution for Promoting Industrial Readiness for Industry 4.0

Among two third of the respondents (71%) think obstacles in implementing industry 4.0 is manageable. Whereas, 29% of respondents think they are not manageable because of unanticipated nature of political situation, poor implementation of policies and non-requirement of innovative technology in their business. Industrial development is the backbone of the economic prosperity of the nation. In developing countries like Nepal, industries are the one of the major source of employment. Thus, developments of industrial areas are essential for the nation. Though there are several challenges while operating industries. Respondents suggests following strategies for industrial development.

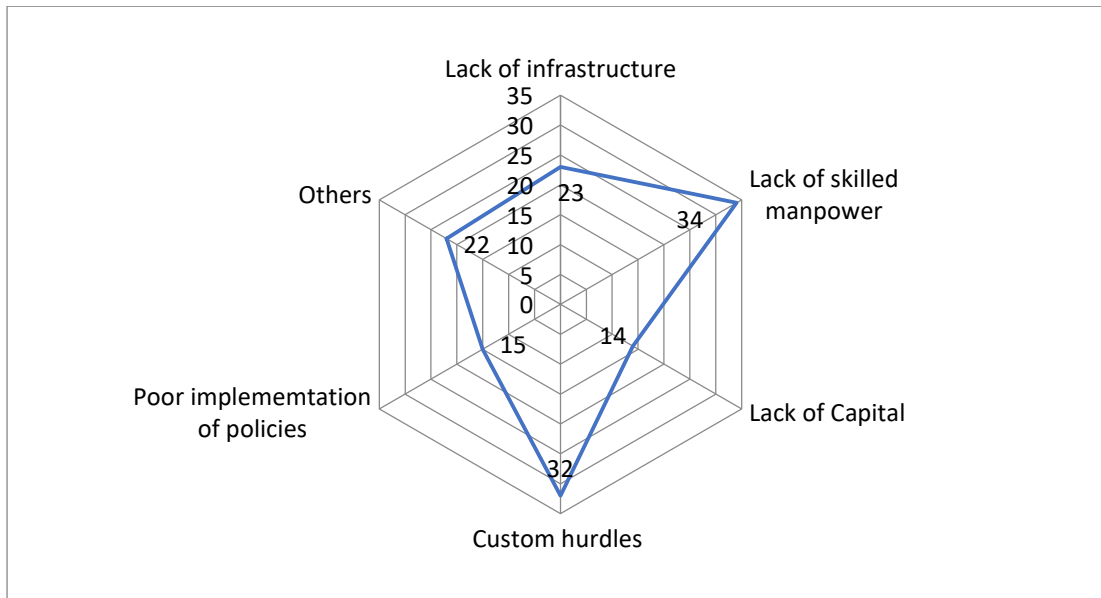


Figure 3: Obstacles of Implementing Industry 4.0

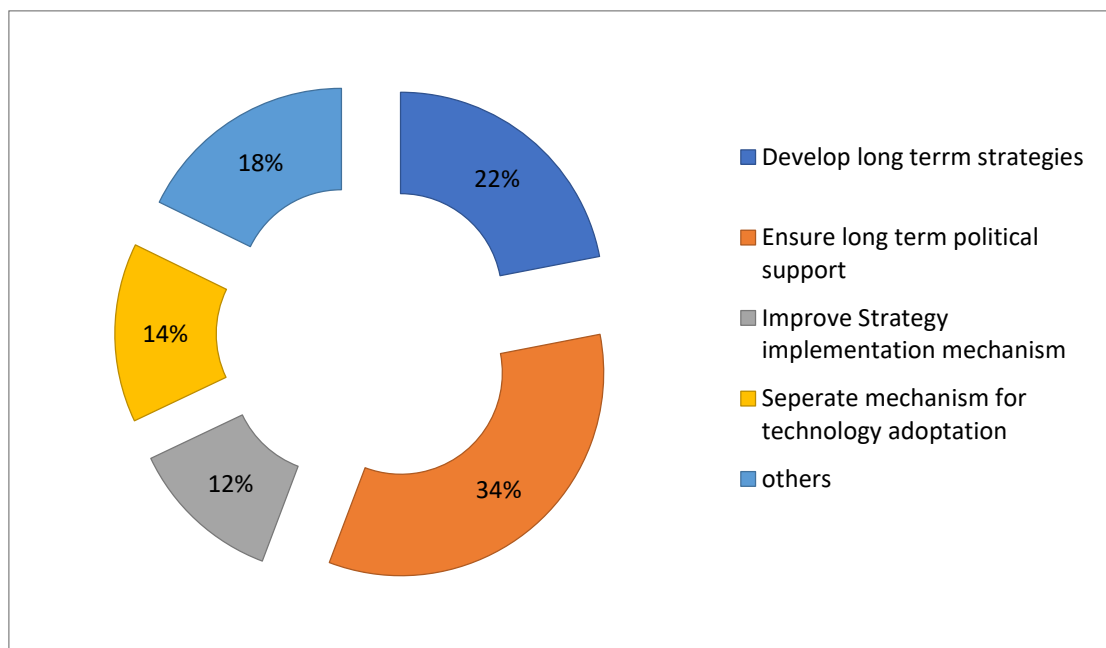


Figure 4: Managerial Solutions

Figure 4 demonstrates strategies that should be implemented for the betterment of industrial sectors. Majority (34%) of respondents revealed that political support for long term is the key factor that may support them to invest in new innovative technologies. Similarly, improvement in implementation mechanism and long term strategy are other factors that help them to facilitate while adopting technologies.

5. Conclusion

The present study describes the obstacles in adopting new and enabling technologies - Industry 4.0 in industries located in three industrial estates of Kathmandu valley. The other aim of the study is to identify managerial implementation for the successful implementation of new technology to enhance industries on the road to industry 4.0. The finding from this study revealed that 51% industries located in industrial estates are were not having any hurdles in adopting new technologies, because of low use or non-use of technologies in industrial process; however 49% industries are facing hurdles while adopting new technologies. This study also found that respondents have positive towards promoting industrial readiness for industry 4.0 and 71% of them think that those obstacles in implementing industry 4.0 is manageable. But, for few respondents, innovative technology in their business is not necessary. Political support (34%) for long term is the key factor that may support them to invest in new innovative technologies along with improvement in implementation mechanism and long term strategy help industries to adopting technologies enabling towards industry 4.0.

Among the industrial of this study's study area 22% of industries states that the major problem was poor implementation of formulated policy and regulation. To make more flexible environment for adoption of new technologies, concern stakeholders should focus on improving Strategy implementation mechanism.

Some important findings can be managed in order to enhance Industry 4.0.

1. *Improve the strategy implementation mechanism:* Among the industrial of this study's study area 22% of industries states that the major problem was poor implementation of formulated policy and regulation. To make more flexible environment for adoption of new technologies, concern stakeholders should focus on improving Strategy implementation mechanism.
2. *Improve Custom Facilities:* The major huddles while importing technologies mention by industries is Custom huddles. For the ease of technology implementation government should improve the facility of custom for industries and remove the huddles as much as possible.
3. *Develop Separate Mechanism for Technology Implementation:* In context of Nepal, industries are still behind the in case of use of innovative technology. For the adoption of technologies in industrial sector concern parties should develop a separate mechanism so that use of technology should ease for industries.
4. *Development of Skilled Manpower:* This is another major challenge for industries while adopting the new technologies in the organization process. Industries were lacking manpower for operating and service of the new technologies. Therefore, stakeholders should focus on developing require manpower for technology implementation.

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