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Edited by Muhammad Mohiuddin, Jingbin Wang , Md. Samim Al Azad and Selim Ahmed

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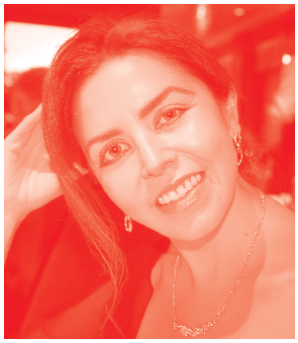

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Meet the editors

Dr. Muhammad Mohiuddin is an associate professor of International Business at Laval University, Canada. He previously taught at Thompson Rivers University, Canada; University of Paris-Est, France; Osnabruck University of Applied Science, Germany; and Shanghai Institute of Technology and Tianjin University of Technology, both in China. His research has been published in several journals, including *Policy*, *Applied Economics*, *Review of Economic Philosophy*, *Strategic Change*, *International Journal of Logistics*, *Sustainability*, *Journal of Environmental Management, Journal of Cleaner Production*, and *M@N@GEMENT*, among others. He is a member of CEDIMES Institut (France), Academy of International Business (AIB), Strategic Management Society (SMS), Academy of Management (AOM), Administrative Science Association of Canada (ASAC), and Canadian council of small business and entrepreneurship (CCSBE). He is currently the director of the Research Group on Contemporary Asia (GERAC) at Laval University. He is also co-managing editor of *Transnational Corporations Review* and a guest editor for *Electronic Commerce Research* and *Journal of Internet Technology*.

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Dr. Samim Al-Azad recently completed his post-doctoral research from Stephen A. Jarislowsky Chair in International Business at Laval University, Canada. He is an assistant professor of Management Information Systems (MIS), North South University, Bangladesh. His current research interests are artificial intelligence (AI), offshore IT outsourcing, IT adoption, and Industry 4.0. His research has been published in peer-reviewed journals, including *International Journal of Logistics Research and Applications*, *Journal of Global Information Management*, *Asian Social Science*, and *Contemporary Management Research*. He has presented several papers at international conferences: Academy of International Business (AIB), Pacific Asia Conference on Information Systems (PACIS), Administrative Science Association of Canada (ASAC). He was awarded the best paper award twice for his papers at the t ASAC-2014 (IB) and ASAC-2015 (TIM) conferences. He also has experience working with BRAC (the world's largest development organization based in Bangladesh) on a number of projects funded by the World Health Organization (WHO) and the United Nations Development Programme (UNDP).

Dr. Selim Ahmed is an associate professor and head of the Business School, World University of Bangladesh. He received his Ph.D. in Business Administration and a Master of Management from the International Islamic University Malaysia (IIUM). Dr. Ahmed has published several books, chapters, and articles in top peer-reviewed journals. He is the consulting editor for *Hospital Topics*, an associate editor for the *Iranian Journal of Management Studies*, and an article editor for *Sage Open*. Dr. Ahmed has reviewed more than 240 papers for 68 peer-reviewed journals. His research areas include quality management, service management, healthcare management, organizational behavior, and human resource management.

Contents

Preface

Global trade is constantly moving and adjusting with the business ecosystem. Advances in technologies, virtualizations of economic activities and business transactions, the openness of transnational borders, regional trade blocs, and worldwide business reforms have facilitated the integration of both small and medium-sized enterprises (SMEs) and multinational corporations (MNCs) into the global trading network. Digitalization has made it easy to order a product from a foreign market and have it delivered right to customers' doors. Accelerated trade among countries has moved from exchanges of raw materials and finished goods to intermediate components of trade-in, value-added products, and services. Though international trade is dominated by trade in goods, the service sector is becoming a more and more important part of international trade. There are, however, different kinds of trends that accelerate or impede global trade. The COVID-19 pandemic has seriously disrupted the global supply chain and forced many firms and countries to reorient their businesses towards local or regional markets. Industry 4.0 is another cyber-physical system (CPS) that is also transforming business activities, especially manufacturing industries, with huge implications for the global value chain. Another important project that is transforming the international business ecosystem in Asia, Europe, and Africa is China's trillion-dollar project called the Belt and Road Initiative (BRI). The BRI is likely to impact greatly on global trade, even though the project has many critics who doubt its contribution to developing and emerging countries with weak financial strength.

Global trade today is operating within a rapidly changing ecosystem. This book addresses this emerging phenomenon and explores how business firms can navigate this uncharted territory. It includes ten chapters organized into two sections: "Emerging Trends in the International Business Arena" and "Managing Global Trade Under New Context" written by authors from across the globe.

Section 1: Emerging Trends in the International Business Arena

In Chapter 1, Edward Asiedu examines the potential effect of the COVID-19 pandemic on the agenda for free trade in Africa, both in the short and long term. Specifically, the chapter explores the trading environment of firms in Africa and highlights the challenges faced when implementing a trade agreement in the middle of a pandemic.

In Chapter 2, Muhammad Mohiuddin, Md. Samim Al Azad, Selim Ahmed, Slimane Ed-Dafali, and Mohammad Nurul Hasan Reza explore the evolution of Industry 4.0, how this new technological framework will create values for firms and consumers, and how we can use it for a firm's competitiveness and save it from the fallout of its development.

In chapter 3, Ismahene Yahyaoui evaluates empirically the impact of ICT and economic growth on CO2 emissions of Tunisia and Morocco for the period

between 1980-2018, based on the Auto-Regressive Distributive Lag (ARDL) analysis. Findings demonstrate that ICT and economic growth affect positively and significantly the CO2 emissions in the short and long term both in Tunisia and Morocco.

In Chapter 4, Kiryl Rudy explores how developing countries like Belarus can protect themselves from the debt trap emanating from infrastructural investment under the Belt and Road Initiative of China. He shows that proper scrutiny of proposed infrastructure projects, better credit terms through negotiation, increasing FDI from China, and joint industrial ventures can help developing countries avoid the dept trap phenomenon.

In Chapter 5, Jelilov Gylych, Abdullahi Ahmad Jibrin, Bilal Celik, and Abdurrahman Isik explore how the short-run impact of oil price fluctuation on the monetary instrument takes place. Specifically, they analyze the role of the exchange rate, inflation, and interest rate and how they respond to shocks in oil price.

In Chapter 6, Sung Jin Kang and Seon Ju Lee investigate the impact of FDI on the trade of the East Asian economic transition countries, namely China, Cambodia, Lao People's Democratic Republic, and Vietnam, employing FDI flow and FDI stock data separately. The authors find that there are complementary effects between FDI and trade.

Section 2: Managing Global Trade Under New Context

In Chapter 7, Maria Alejandra Madi elaborates analysis of the complex drivers that shape corporate diplomacy competencies and strategies and the potential results of corporate diplomacy in a global trade scenario that has been deeply affected by the coronavirus pandemic. Among her key findings, the author finds that the Brazilian experience after the outbreak of the coronavirus pandemic shows that the role of corporate diplomacy as a business tool of governance to defend sectorial interests might be crucial to normalize trade flows.

Globalization has created accelerated cross-border mergers and acquisitions as well as mobility of human resources across the globe. In Chapter 8, Chang-Howe Wenjia explores the integration process during and after mergers and acquisitions where one firm (Chinese) has a dominant position in comparison with another (Western firm). This chapter analyzes the human resources integration process in pre-and post-acquisition to determine critical success factors and presents a framework that determines the success or failure factors and the actions required.

In Chapter 9, Yanghua Zhou analyzes what kind of regional cultures and institutions have an impact on employee satisfaction and motivation in MNCs. Findings show that Japanese expatriates working in the United States, Singapore, and Indonesia had a greater degree of job satisfaction than those working in cultural regions such as China, Taiwan, and Australia.

In Chapter 10, Phindile Chili and Noluthando Matsiliza focus on the importance of quality standards for SMEs. They studied the enforcement and compliance of quality standards in small business practices and found that there is a relationship between the adoption of quality standards and business excellence and that government has a role to ensure the compliance of statutory quality management systems.

This book presents interesting and timely topics that readers will find important for understanding the dynamics of the global business environment in an era of rapid changes in technology and a worldwide pandemic, as well as how businesses will evolve in a hopefully COVID-free future.

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Section 1

Emerging Trends in the International Business Arena

Chapter 1

The COVID-19 Pandemic and African Continental Free Trade Area (AfCFTA): Exploring Potential Impacts and Developmental Implications

Edward Asiedu

Abstract

The COVID-19 pandemic has caused nontrivial disruptions to global value chains and affected the lives of many people, particularly the poor across the world. The outbreak of the COVID-19 pandemic in the early part of 2020 in Africa, happened during a time that African countries had just signed one of the world's largest trade agreements and therefore began introducing continental-level structures to strengthen free trade among member states. This chapter examines the potential effect of the COVID-19 pandemic on the agenda for free trade in Africa, both in the short and in the long-term. Specifically, the chapter explores the trading environment of firms in Africa and highlights generally the challenges faced when implementing a trade agreement in the middle of a pandemic. It also, on the other hand, highlights how trade agreement in a middle of a pandemic can be a good thing to minimize the effect of the pandemic on poor and vulnerable households in Africa. The chapter ends by highlighting the need for managing the COVID-19 pandemic to grow and sustain intra-African trade.

Keywords: Trade, Africa, African Continental Free Trade Area, COVID-19, SDGs

1. Introduction

Africa's most ambitious trade initiative, the African Continental Free Trade Area (AfCFTA) agreement, was signed and launched at the African Union (AU) Assembly on 21 March, 2018 in Kigali, with the agreement fully coming into force on 30 May, 2019. Out of the 55 member states, 34 countries have both signed and deposited their instruments of AfCFTA ratification. However, due to the political situation in Eritrea, the country has yet to join the agreement.

The AfCFTA agenda is to boost intra-African trade by around 60% by 2022. The agreement was necessitated by the low level of intra-African trade before the signing of the agreement. Data from the African Development Bank (AfDB) showed for example that trade among African countries was about 10% in 2000. Fourteen (14) years afterward, in 2014, and prior to the signing of the AfCFTA agreement, even though intra-African trade had increased, the continent recorded barely a 6%

increase in intra-Africa trade, over the 2000 base level [1]. Thus, despite the intensification of bilateral intra-African trade agreements over the past two decades, still, only 16% of international trade by African countries took place within Africa in 2014.

A number of empirical and anecdotal evidence have shown the importance of intra-regional trade on poverty reduction. For example, regional organizations' are better positioned to link regional trade to region-wide health, education, social protection, and other public goods policies, and therefore provide a platform to strengthen global, regional, and national actions on poverty reduction [2]. A number of researchers have emphasized the intra-regional trade, employment/income linkages [3–5], whereas others emphasized the intra-regional trade and investment linkages [6–8], and how these linkages do impact poverty at national and regional levels. Das [9] argues that the linkages need to be analytically understood and empirically examined to make regional cooperation initiatives development-oriented.

Nudging free trade by eliminating bottlenecks associated with intra-regional trade can be pivotal towards addressing poverty and food insecurity in many parts of Africa (see [10]). Others argue that the advantage of intra-African trade is not solely in the production and trade of raw food products and thereby reducing food insecurity, but also countries with more advanced manufacturing sectors hold potential for Africa's growth, and a reduction in imports if such countries in Africa can access the larger African market (see [1]). However, despite the need for stronger economic cooperation in developing countries, Das [9] intimate that there are very few regional economic integrations in the developing world, with many successful economic groupings found in the developed world.

For example, despite the potential effect of economic integration, evidence from ASEAN countries, namely Indonesia, Malaysia, Philippines, Singapore, and Thailand have shown the limited effect of small level integration schemes on trade. Specifically, Sharma and Chua [11], for example, found that the ASEAN integration scheme did not increase intra-ASEAN trade, but an increase in trade occurred with members of a wider Asia-Pacific Economic Cooperation (APEC) group. Kweka and Mboya [12] found that regional integration with the Southern African Development Community (SADC) and East African Community (EAC) led to increased trade and employment within the region. Evidence from the Economic Community of West African States (ECOWAS) which adopted its 'West African Common Industry Policy' in 2010 saw an increase in intra-regional trade and increased creation of high-quality jobs but faced high trade cost which prevented less productive firms from entering the regional market (see [5] for more details). For the countries of the Middle East and North Africa (MENA) in the Arab- Maghreb Union (AMU), the Greater Arab Free Trade Area (GAFTA) which was meant to increase trade between MENA countries and that of other Arab countries was initially limited to goods liberalization and did not include trade facilitation among its provisions, and therefore had little impact on regional trade due to restrictive non-tariff measures and inefficient cross-border measures (see [13, 14]). However, full trade liberalization in the GAFTA led to a significant increase in intra-regional exports, particularly for the Maghreb sub-region, where export growth reaches around 6% [13].

The African continent is made up of 55 countries and if all countries would negotiate a bilateral trade agreement with all other African countries, there would be 1,485 bilateral FTAs (55 x 54 divided by 2) [15]. A number of authors have argued that the multiple memberships of numerous regional economic communities (RECs) have seemingly contributed to the slow progress of inter-regional integration on the African continent [16, 17]. Thus, even though there are benefits to sub-regional bloc integration i.e., ECOWAS, EAC, SADC, and AMU, a universal

trade bloc that encompasses all the sub-regional blocs would have a much better potential to increase trade, and as such stand a chance of making a significant push towards reducing the severity of poverty in Africa. It is in this spirit, that the African Continental Free Trade Area (AfCFTA) was mooted and signed by many African countries across the various traditional economic blocs.

This chapter discusses the short and long-run effects of the COVID-19 related shocks on the success or otherwise of the African Continental Free Trade Area (AfCFTA) agreement, and how such outcomes can impact the welfare of the poor. The discussion also explores the channels through which the COVID-19 shocks are transmitted, namely through consumption, production, and market-based labor activities.

2. Background and structure of the AfCFTA agreement

After decades of emphasis on sub-regional trade blocs in Africa, the African Continental Free Trade Area (AfCFTA) agreement was finally signed and launched in 2018. The key objective of this agreement is to create a single African continental market for goods and services, with free movement of business persons and investments, and thus pave the way for accelerating the establishment of the Customs Union. As an auxiliary but important objective, the agreement also hopes to boost Africa's trading position in the global market by strengthening Africa's common voice and policy space in global trade negotiations. The specific objectives of the AfCFTA are:

a. progressively eliminate tariffs and non-tariff barriers to trade in goods;

b. progressively liberalize trade in services;

c. cooperate on investment, intellectual property rights and competition policy;

d. cooperate on all trade-related areas;

e. cooperate on customs matters and the implementation of trade facilitation measures;

f. establish a mechanism for the settlement of disputes concerning their rights and obligations; and

g. establish and maintain an institutional framework for the implementation and administration of the AfCFTA.

The AfCFTA is governed by five (5) operational instruments, namely, rules of origin; the online negotiating forum; the monitoring and elimination of non-tariff barriers; a digital payments system, and the African Trade Observatory. Challenges in the implementation of any of the instruments can affect the utilization of the tariff and general trade provisions under the AfCFTA. For example, complex criteria used to determine the national source of a product and how the source of intermediate products used in production are treated have impacted the extent to which firms on the continent will pursue and will be involved in the AfCFTA agenda. Therefore, procedures for the issuance of certificates of origin must follow smooth and efficient processes, at the same time minimize the risk of re-exports. Improved ICT infrastructure on the continent is imperative therefore for the

effective functioning of the online negotiation forum, obtaining online certificates of origin, the digital payments system, and the African Trade Observatory.

The broader institutional framework for the implementation, administration, facilitation, monitoring, and evaluation of the AfCFTA consists of the Assembly, the Council of Ministers, the Committee of Senior Trade Officials; and the Secretariat. For the latter, Ghana was selected to host the AfCFTA Secretariat and the Secretariat's key role as stated in the agreement, is to provide administrative support for the implementation of the AfCFTA Agreement, such as convening meetings, monitoring and evaluating the implementation process, and other duties assigned to it by the Committee of Senior Officials, Council of Ministers, and the AU Assembly.

The AfCFTA is also accompanied by other continental initiatives such as the protocol on Free Movement of Persons, Right to Residence and Right to Establishment, and the Single African Air Transport Market (SAATM) [18]. In a nutshell, the AfCFTA arrangement is expected to create the biggest free trade area in the world, based on the number of nations that have signed and ratified the agreement. The settlement therefore will join 1.3 billion individuals across 55 nations, with a consolidated Gross Domestic Product (GDP) esteemed at US$3.4 trillion.

The expectation for this agreement is quite huge. It is expected that approximately 30 million individuals will be lifted out of poverty. Accordingly, it is expected that over-all from the agreement, the agreement will bring about $16.1 billion in welfare gains [19]. It is also argued that the full accomplishment of AfCFTA would reshape markets and economies across the region and increase services, manufacturing, and natural resources sectors, and subsequently increase the real income gains by 7 percent or approximately US$450 billion.[1]

3. Pre COVID-19 trade

Putting the effect of the COVID-19 pandemic on the AfCFTA and trade volumes into perspective, it is important to first highlight the state of trade within Africa prior to the coming into effect of the AfCFTA. In 2016, prior to the signing of the AfCFTA, the total intra-African exports amounted to USD 62.2 billion. Earlier data from 2000 to 2010 shows relatively very low values of intra-African trade (see **Figure 1**). Over the period, intra-African imports represented an average of 14.2 percent of total African imports, while intra-African exports represent 10.4 percent of total African exports. Altogether, over the period 2000 to 2010, intra-African imports amounted to USD 29 billion whereas, intra-African exports amounted to USD 30 billion [20].

Overall, intra-African trade data have shown low levels of regional trade on the African continent prior to AfCFTA and the pandemic (see **Figure 2**). Total exports, for example from the Northern African region to other countries in the northern region, amounted to 5% in 2011, whereas exports from the Northern African region to the other individual regions on the continent amounted to 1% or less of total exports [16, 21]. Total export within a region is highest for exports within the Eastern bloc (EAC), where total exports from the Eastern Africa African region to other countries in the east amounted to 15% in 2011. For the other regions, exports within a bloc are less than 10%. For example, total exports from the Southern African region to other countries in the south, and that from Western Africa to other countries in the west accounted for 8% of the bloc's exports. As shown by

[1] https://theindependentghana.com/2020/07/world-bank-forecasts-afcfta-to-boost-africas-income-by-us450bn/

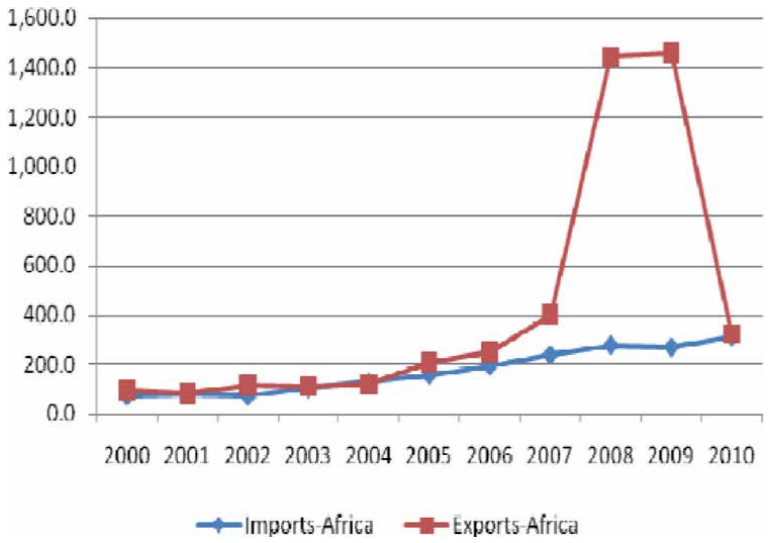

Figure 1.
Intra-African trade from 2000 to 2010 (billions of US dollars). Source: Statistics division, AUC.

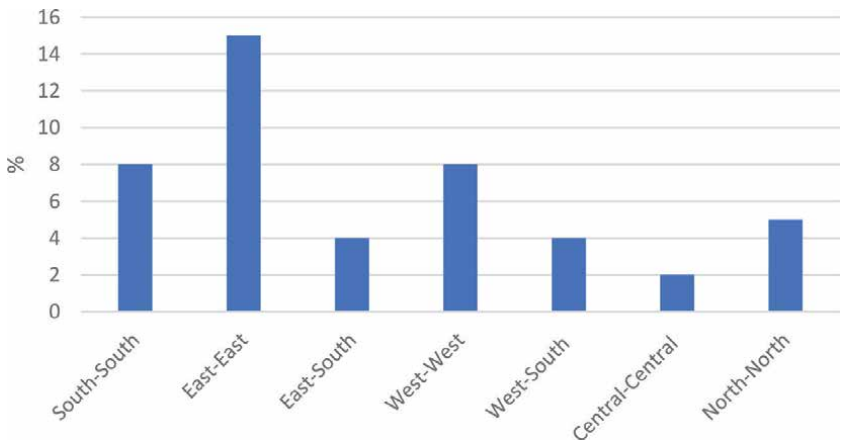

Figure 2.
Inter-African trade within blocs 2011. Source: Jordaan [16].

Figure 2, prominent inter-bloc trade took place between the east and south (EAC-SADC), and west and south (ECOWAS-SADC), which accounted for 4% of total exports in both cases.

Table 1 below highlights some major bilateral intra-African exports on the continent prior to the signing of the AfCFTA agreement in 2017.

Table 1 indicates that the largest single value of bilateral trade took place between Nigeria and South Africa, followed by Ghana and South Africa. Overall, the share of intra-African exports as a percentage of the continent's total exports stood at 16.6% in 2017 [22]. From the data, the top five (5) intra-African exporters are South Africa, Nigeria, Ghana, Angola, and Algeria. The expected benefits from the AfCFTA will to a large extent depend on the country's pre- AfCFTA bilateral intra-African trade volumes. Countries with a lower share of pre- AfCFTA intra-African trade will benefit significantly from this agreement.

Exporter	Importer	Value (USD '000)	% of total intra-African exports
Nigeria	South Africa	1,892,285	3.0%
Ghana	South Africa	1,362,906	2.2%
Angola	South Africa	982,401	1.6%
South Africa	Dem Rep. of the Congo	782,502	1.3%
South Africa	Angola	562,933	0.9%
South Africa	Kenya	556,610	0.9%
Algeria	Morocco	499,056	0.8%
Mali	South Africa	474,239	0.8%
Nigeria	Cameroon	467,079	0.8%
Egypt	Algeria	464,406	0.7%

Source: TWN, [15].

Table 1.
Major bilateral export relationships.

Data from West Africa is quite interesting in terms of highlighting the composition of intra-African trade. Von Uexkull [5] noted that for some countries the share of manufactured good is substantially higher among other ECOWAS countries than exports to global markets. For example, Benin exports manufactured food, beverages and Tobacco and some construction materials (steel and cement) to the ECOWAS countries while for the rest of the world their main export is cotton. Cote d'Ivoire exports mainly refined petroleum products to ECOWAS and cocoa/cocoa butter to the rest of the world. For Ghana, the country exports manufactured wood, plastic and textiles to ECOWAS, semi-processed gold to South Africa and mainly cocoa to the rest of the world. Togo, the country with the highest share of intra-ECOWAS trade (59%) exports steel, cement, packaging materials and food products (margarine, flour, mineral water) to ECOWAS and cocoa/mining phosphates to the rest of the world (see [5] for a detailed breakdown of intra-ECOWAS trade).

Trends in the share of total merchandised export of the top five (5) countries in Africa's export (see **Figure 3**) prior to the pandemic provides evidence on the potential of AfCFTA in improving total trade volumes for countries with traditionally small levels of export. The data as presented in **Figure 2** shows that, from the 1980s, except Angola and Morocco that has experienced marginal increases in their African export shares, large countries such as South Africa, Nigeria, and Algeria has seen a decline in their share of Africa's export. One would expect that the structures instituted under the AfCFTA will empower not only the traditionally large export countries in Africa but also help empower small countries with low trade potentials and limited pre- AfCFTA export volumes to expand export.

In addition, data collected prior to the agreement and outbreak of the COVID-19 pandemic showed that the majority of enterprises in Africa considered customs and trade regulations as a major constraint to trade. Precisely, Stuart [24] found that the percentage of African enterprises identifying customs and trade regulations as a major constraint is almost 40% higher in Africa than in the rest of the world. The AfCFTA aims to eliminate import duties and reduce non-tariff barriers significantly. Thus, improving trade procedures through enhanced trade facilitation should reduce bottlenecks associated with intra-African trade.

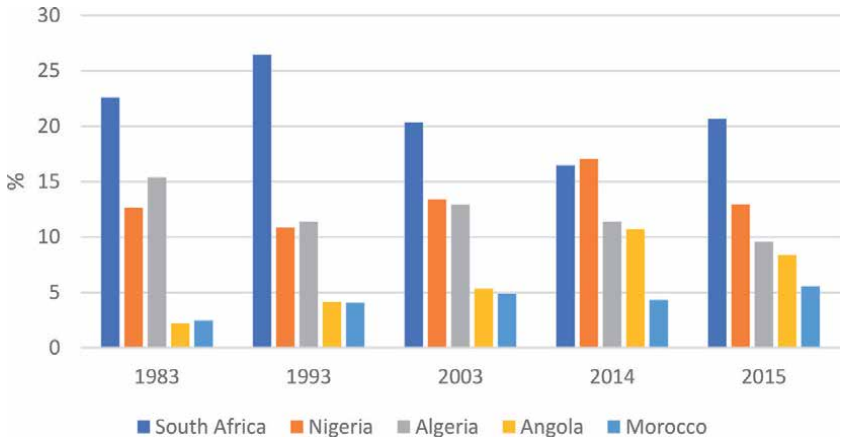

Figure 3.
Share (%) of top five countries in Africa exports. Source: Verter [23].

We argue that despite the enormous potential in using intra-regional trade to help reduce poverty and food insecurity in some part of Africa, the strength of these linkages both in the short and long-term will depend on the direct effect of the COVID-19 pandemic on the implementation of the trade agreement, and on the institutional structures that are in nascent stages.

4. COVID-19 impacts

Mold and Mveyange [25] found a large increment in the volume of Kenya's total export in the first quarter of 2020 (prior to the outbreak of the pandemic in Africa), attributed partly to intra-African trade that was beginning to intensify due to the enhanced effort under the AfCFTA framework. There is however now increasing fear and hesitation around the world due to the Covid-19 pandemic, which has led to a new set of behaviors [26]. For Africa, about 0.5 percent of the population is confirmed to have contracted COVID-19 COVID-19 [27]. The financial interdependency and multilateral regulations that globalization stressed some decades ago, are now facing daunting and unsettling threats. As the pandemic and its impacts continue to extend deep, with both health and economic consequences taking a toll on most developing countries, trade has not been spared. Thus, although the AfCFTA addresses several tariff and non-tariff barriers, the COVID-19 pandemic has the potential to erode the potential benefits of this agreement. We explore the effect of the pandemic on the AfCFTA agreement, consumption, production, and market-based labor activities, with implications for volumes of trade in the middle of a pandemic.

4.1 Impact on the AfCFTA agreement

The Covid-19 pandemic could erode the expected benefits of the AfCFTA agreement.[2] The global spread of the pandemic has strong implications for trade and mobility [28]. This is the first direct effect the COVID-19 pandemic have had on the implementation of the AfCFTA agreement itself. The fulfillment of AfCFTA was deferred due to the pandemic, hence the AfCFTA agreement which was planned to start on 1st of July, 2020 was postponed to 1st January, 2021 [29].

[2] The Coronavirus Virus (COVID-19), first discovered in Wuhan City of China in December 2019. It has now spread over the globe.

COVID-19 management systems instituted by countries at a time the AfCFTA was in its critical phase of implementation have directly impacted intra-African trade. These measures have included travel bans, border closures, mandatory quarantine, partial lockdowns, and total local lockdowns. Negotiation of key aspects of the agreements such as Rule of Origin and Schedules of Tariff Concession stalled due to the outbreak of COVID-19, as some of these aspects of the agreement require physical contacts to achieve full operationalization of the agreement. In all, the pandemic caused a six-month delay of the AfCFTA agreement.

At the administrative level, the pandemic has affected the organization of the second biennial Intra African Trade Fair (IATF) which was slated for 2020 but delayed until somewhere in 2021. The fair was to provide a platform for stakeholders to share trade, investment, and market information aimed at supporting intra-African trade and African economic integration [29].

4.2 Impact on consumption, production, and market-based labor activities

The COVID-19 pandemic has led to instabilities in Africa's supply chains, notwithstanding tumbling oil costs and a lessened worldwide interest for African non-oil products. Thus, despite the fall in oil prices, weak African and global demand precipitated by the COVID-19 pandemic has affected production on the continent. A decrease in intra-African and global exports from Africa have affected revenues and growth across countries in Africa. It is projected that Africa may lose half of its GDP with growth falling from 3.2 percent to about 2 percent due to the disruption of global supply chains (Africa [30]). As observed by Sachs and Malaney [31] large-scale viral diseases can have a significant long-term impact on GDP and per-capita income.

The fall in oil price has also directly placed excessive economic and monetary risk on countries like Angola, the Democratic Republic of the Congo (DRC), Nigeria, and other importing African countries. In addition, China where the virus was first discovered, is the biggest trading investor of many countries in Africa prior to the spread of the virus [32]. The U.S Energy Information Administration also projects that the United States will likely take years to return to 2019 levels of energy consumption.[3] All these developments will affect the GDP and employment in many of the oil-producing countries in Africa.

The United Nations Development Programme (UNDP) suggested that the COVID-19 crises could result in huge unemployment in Africa, where unemployment was already a major problem prior to the pandemic [33]. The pandemic also affected the nature of work, with many workers working fewer hours post lockdown, to minimize exposure to the virus. The closing down of mines and factories, changes in nature of work, and shortages of imported inputs due to the lockdown measures imposed by many African countries, have affected production, export, earnings, and wellbeing in Africa in the next couple of years.

Aside from production, at the micro-level, Durizzo et al. [34] have shown that the pandemic negatively affected household consumption and welfare in Ghana and South Africa. Similar evidence of reduced consumption is also found for many of the major countries that Africa trades with. For example, Chen et al. [35] have found long-term impacts of the COVID-19 pandemic on consumption using high-frequency transaction data.

Data from the European Union shows a 17.3% year-on-year decline in household final consumption expenditure.[4] Lower levels of consumption within Africa on one hand, and in the other trading partners on the other have all affected demand

[3] https://www.eia.gov/todayinenergy/detail.php?id=46636

[4] https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20201110-2

for African goods. All these changes in consumption have led to reduced demand for African products, and as such led to a significant reduction in production and employment. Data from the International Labour Organization (ILO) suggests that approximately 1.6 billion informal economy workers and 436 million enterprises were significantly impacted by the pandemic and the lockdown measures, with many of the affected being women-owned and managed firms, and firms managed by persons with disabilities (PWDs).[5] It is therefore important to put in policies to limit income loss for both formal and informal sector employees, in order to minimize poverty and vulnerability on the African continent.

Industrial production in Africa is not spared. The pandemic has slowed demand for Africa's agricultural export products, and therefore putting the jobs and livelihoods of many households at risk. It has also disrupted the supply chain for agricultural inputs such as improved seeds, fertilizers, crop protection products, equipment, etc., from neighboring countries. Poor infrastructure and the high cost of doing business were already challenging intra-African trade prior to the pandemic. The pandemic has exacerbated the problem and has created challenges on both the supply and demand-side. Overall, industrial production in Africa is estimated to have decreased by 1.2% due to COVID-19 induced factory shutdowns. Similar reductions in production are recorded for Africa's trading partners. Production losses in Africa will continue to increase if infection rates continue to increase and factory shutdowns are reinstated to curb the spread of the pandemic.

Remittances, an important income source of household income for household production and consumption have been affected significantly by the pandemic. Thus, the pandemic has led to reduced mobility, increased restrictions, affecting FDI flows, tightening the domestic financial market, and leading to heightened unemployment.

In a nutshell, disruption in supply chains for production inputs, falling demand for Africa's production, near collapse of tourism and hospitality sectors, reduced remittances, high fiscal deficits, and the observed depreciation of local currencies have heightened existing household vulnerabilities. The region remains vulnerable to health shocks due to the undeveloped health systems in many African countries. Vaccine rollout as of February 2021 had been very slow across the continent, even though infection and death rates are rising. Failure to address these long and short-term challenges can affect production and slow trade for many African countries.

4.3 COVID-19, gender and trade

Examining the effect of the pandemic through a gender lens will help to tailor trade support for women involved in the intra-African trade. Experience from the Ebola virus showed that quarantines significantly reduce livelihood activities, and exacerbating poverty rates among women. Women are predominantly involved in the small cross-border trading in Africa. Many of the measures instituted by African countries to curb the spread of the pandemic, such as the mandatory quarantines at the borders, national-level lockdowns, and limitation on mobility have all impacted the trade activities of women involved in cross border trading. The COVID-19 impacts are felt especially by women who generally outnumber men in the informal trade sector, and across many countries are earning less. Thus, women traders, compared to men, who have low savings and capital will be disproportionately impacted by the pandemic and the associated mitigation measures.

[5] https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/briefingnote/wcms_743146.pdf

It is crucial for policymakers in Africa to consider cross-border traders as essential staff requiring priority in any pandemic vaccination rollout. Continued engagement with informal trade associations along the land borders of Africa is imperative to sustain intra-African trade in the middle of a pandemic. Training of women involved in cross-border trading on the digital tools needed for the key aspects of the agreements such as the rule of origin, schedules of tariff concession, and digital payments system are critical to limited exposure to the COVID-19 virus.

In a nutshell, females' involvement in intra-African trade is crucial for the overall AfCFTA agenda, and therefore there is the need for targeted support for women involved the cross-border trading with the African continents. Support can take the form of stimulus packages, early vaccination, free COVID-19 tests, and education on the virus to curb the spread of the virus among this group and at the same time sustain intra-African trade.

4.4 Opportunities in the middle of a pandemic

The pandemic does not only present negative effects but also provides the African continent and the AfCFTA agreement the chance to explore new ways of engagements, new markets, new products, and the opportunity and time to devise ways to mitigate the effect of the pandemic on trade and welfare. Thus, despite the short-term poor outlook, the pandemic has presented some opportunities that could translate into long-term increased opportunities for industry growth and employment.

The pandemic and the associated restriction on mobility has also presented an opportunity for African countries to reinforce local production and intensify import substitution of many products and the heightened need to the intra-African supply chains in order to better deal with any future pandemics. For example, in terms of pharmaceuticals, Africa spends quite a lot to import drugs from Europe and Asia, regions that have experienced huge disruptions in their supply chains. African countries with the capacity for the production of pharmaceuticals can be supported under the umbrella of AfCFTA to increase inter-regional trade of pharmaceuticals, for mutual intra-African economic benefits. With Africa plagued with many diseases, local production of all forms of pharmaceuticals will help to create sustainable long-term jobs and improve wellbeing.

Intra-African trade can be leveraged to deal with persistent and COVID-19 induced food insecurity. With a number of African countries being net exporters of food and with many others importing food from Europe and Asia, the pandemic provides the opportunity for strengthening food value chains and infrastructure under the AfCFTA. Thus, food can easily be moved from countries that have food surpluses to those that have food deficits if under AfCFTA transportation networks in Africa are improved.

In addition, despite the disruption of the international supply chain and delays in export/import channels, some companies particularly in the telecommunication sector have reported positive growth in revenues. AfCFTA can also leverage the improved internet connectivity on the African continent to enhance trade negotiation and drive-up volumes of trade transactions within Africa. Thus, as the world struggles to deal with both the health and economic effects of the COVID-19 pandemic and forestall trade, it can be said that the AfCFTA agreement is coming in at the right time.

5. Conclusion

The COVID-19 pandemic has imposed nontrivial cost on all economic agents, with implications expected to last for a while. While the pandemic has had

consequences for trade and mobility, it has highlighted the need for strengthening value chains in general, and intra-African trade structures to be specific, in order to position Africa to better deal with any unforeseen future pandemic. This chapter explored the current and potential impacts of the COVID-19 pandemic on the African Continental Free Trade Area (AfCFTA) agreement, highlighting the effects on the trade agreement itself, trade volumes – driven by the pandemic induced-changes in consumption, production and labour markets –, and women on the intra-African trade corridors. The chapter also highlights the opportunities that African countries can take advantage of even in the middle of the pandemic. Thus, the chapter ends on the not that while Africa deals with the crisis, it must use the opportunity to strengthen African institutions, to improve trade far beyond the COVID-19 pandemic.

Abbreviation

AfDB	African Development Bank
AfCFTA	African Continental Free Trade Area
AMU	Arab Maghreb Union
AU	African Union
AUC	African Union Commission
CEN-SAD	Community of Sahel-Saharan States
COVID	Coronavirus Disease
COMESA	Common Market for Eastern Southern Africa
DRC	Democratic Republic of the Congo
EAC	East African Community
ECCAS	Economic Community of Central African States
ECOWAS	Economic Community of West African States
FDI	Foreign Direct Investment
GDP	Gross domestic product
IATF	Intra African Trade Fair
IGAD	Intergovernmental Authority on Development
ILO	International Labour Organization
PWDs	Persons with disabilities
REC's	Regional Economic Communities
SAATM	Single African Air Transport Market
SADC	Southern African Development Community
SARS.	Severe Acute Respiratory Syndrome
TFTA	Tripartite Free Trade Area
UMA	Arab Maghreb Union
UNDP	United Nations Development Programme
WHO	World Health Organization

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Chapter 2

Evolution of Industry 4.0 and Its Implications for International Business

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Abstract

Industry 4.0 is the natural consequence of the techno-industrial development of the last decades. It has the huge potentiality to change the way globalization of manufacturing and consumption of goods and services that take place in the global markets. This chapter will focus on the evolution of Industry 4.0 and how this new technological framework will create values for firms and consumers, and how we can use it for a firm's competitiveness and save them from the fallout of its development. An extensive literature review shows that the multi-faceted technology will hugely impact the global value chain, global supply chain, and new global division of labor (NGDL). It will reconfigure and re-distribute the business activities in the developing, emerging, and developed country markets and small and medium sizes firms and MNCs. The rapid development of technological and human capabilities can allow firms to reap benefits from this technology. At the same time, there are many challenges related to skill shortages, technological issues, business ethics, and values that need to be overcome to reap a profit from this new technological advancement.

Keywords: industry 4.0, cyber-physical system (CPS), global value chain (GVC), global supply chain (GSC), big data

1. Introduction

Industry 4.0 has both expanded the possibilities of digital transformation and increased its importance to manufacturing, with an emphasis on globalization, international trade, and foreign direct investments. Industry 4.0 combines and connects digital and physical technologies including artificial intelligence, the Internet of Things, additive manufacturing, robotics, cloud computing, and others to drive more flexible, responsive, and interconnected enterprises capable of making more informed decisions [1]. The infusion of digital technologies in the value chain processes of research and development, design, production, marketing, distribution, and customer services will drive efficiency in production, thereby increasing the ambits of international trade.

Developed in Germany, currently, Industry 4.0 has become the most discussed issue in the industrial arena in the world. Both managers and policymakers from developed, emerging, and developing countries are debating this issue about how

they can participate in this fourth industrial revolution as well as save them from the fallout of this advancement. The issue is still evolving, and experts from all spheres of industry and markets are debating on it. The objective of this chapter is to participate in this debate and explore how Industry 4.0 will evolve in the coming years and how it might affect international trade and the global value chain. We will take an in-depth look into what exactly is Industry 4.0 in our globalized context, what it brings to the table when it comes to international businesses and how international organizations can benefit from Industry 4.0 in their globalization strategies? As a matter of fact, Industry 4.0 outperforms the previous industrial revolutions we have gone through during the past centuries. The fourth industrial revolution is the result of the combination between the real and the virtual world, in which deep learning encourages and challenges human capacities and frontiers, particularly, with the increase of cyber-physical systems. Indeed, the new industrial revolution which develops deep learning is not limited to the use of automation systems based on machine learning, but autonomous ones that do not systematically depend on human beings and which can learn and act by themselves. Industry 4.0 refers to many concepts such as artificial intelligence, smart technologies, smart factories, smart automation, or smart management like the implementation of enterprise resource planning and automation of robotized processes. The global business environment has already started to enhance efficiency with futuristic and high-value-added technologies, from which we are not able to see the frontier clearly for now.

Firstly, we will undertake a brief literature review to explain how we structured our work. We will then be having a great detailed analysis of Industry 4.0 and its main components and how it is changing the way corporations do business in an increasingly connected world. Parallelly, we will explore the opportunities that the fourth industrial revolution brings as well as the challenges which emerged from this new revolution in order to counterbalance and give a realistic view of the latter. Finally, we will illustrate the major strategies that can enable the organization to avail opportunities emanated from Industry 4.0.

2. Opportunities and strengths of Industry 4.0

Industry 4.0 contributes to the virtualization of a physical production environment that facilitates connectivity and interaction between the machines as well as man and machines in real-time. The automation and connectivity as well as machine learning facilitate the inter-connectivity and improve the production process and bring several benefits to the organization. Some of them are presented in the following sections.

2.1 Generator of efficiency

Industry 4.0 is a generator of efficiency. Indeed, the great use of technologies within the different steps in the supply chain helps with optimizing the latter. It is, therefore, cost-effective, time-effective and it globally enhances productivity as well as flexibility and quality of outputs, which also raises the overall reliability of the firm and so the value of the company and its competitiveness. Industry 4.0 is not only about using high technology machines to produce more rapidly. There is indeed much more to that. Industry 4.0 can contribute to streamlining the value chain thanks to its transformation of every aspect of the production process from the logistics, passing through the managerial issues, to the networks, and more generally, the whole structure of firms in the network.

First of all, firms can benefit from *advanced planning and controlling with relevant, real-time data* [2]. Indeed, the collection and great use of data help with a greater inner and outer communication and organization, even from an international perspective: from a headquarter in Quebec City (Canada) to a manufacturer in Dhaka City (Bangladesh), for instance. Planning is simple and effective, and accessible for all employees who need to access it, and can be easily changed. The improvement of communication also implies a greater control of the organization thanks to easy access of the information, anywhere, anytime.

Data is the basis of all the improvements around artificial intelligence and the comprehension of the opportunities that can be taken in the organizations. Used correctly, data and communication tools can help firms to better respond to customers' demands and allow a better accuracy of forecasts too. Data within the industry can help to see what should be improved in terms of production methods to gain efficiency. In that sense, they can also more easily identify bottleneck products which would result in better opportunity costs. Firms can also benefit from greater management and control thanks to adapted software within the firm. Data can be used to analyze production time and costs, as well as comparisons of portfolios of suppliers and materials to get the best of their interest. It allows a rapid reaction to changes and errors. It also allows a quick adaptation when it comes to stock levels, wherever it is from the production or the purchasing teams' perspectives. Finally, data is the base of artificial intelligence. Thanks to machine learning, data is used to learn from mistakes and successes, which is crucial to be exponentially improving.

Thanks to data, programs are elaborated to improve the business networks such as suppliers with industries or with clients, or from clients to employees when they make a requirement for a change in the process of making an order. The communication is smoother, quicker, and easier to take action. Technologies also allow better safety of work conditions. The efficiency of new technologies allows companies to be more sustainable thanks to smart production facilities, which allows a better allocation of resources and vertical networking of smart production systems. The vertical networking of smart production systems can be defined as *Smart factories and smart products, and the networking of smart logistics, production and marketing, and smart services, with a strong needs-oriented, individualized and customer-specific production operation* [3]. Most firms affirm that Industry 4.0 and its innovations contribute to efficiency and profitability [4]. Industry 4.0 gives companies a better competitive advantage. This has a great impact on a company's profitability. This is partially due to a reduction of costs from the efficient use of resources. On top of this, we can observe the benefits of Industry 4.0 through its four main components [3]:

- *The vertical networking of smart production systems:* Vertically integrated Smart productions use deeply integrated data in order to rapidly orient the production in a customer-specific direction depending on the demand and the stock levels. The production is monitored by cyber-production systems (CPS) and smart sensor technologies (SST) that automatize the organization, making it autonomous. As a result, maintenance and management of production systems are optimized. All the processes at all stages and the resources that come with them are logged, which helps to perpetually update the fluctuations and adapt quickly to any movement of these factors. In a nutshell, the goal of this vertically integrated system is the efficiency of resources, and the satisfaction of specific, individual requirements of customers. These advanced systems allow firms to communicate in real-time with their supply chain partners across the globe, from producers to the clients and suppliers, and consequently to adjust their global supply chain on a continuous basis.

- *Horizontal integration via a new generation of global value chain networks*: The horizontal integration is a new model of the value-creation network: *optimized real-time networks that enable integrated transparency, offer a high level of flexibility to respond more rapidly to problems and faults, and facilitate better global optimization* [3]. Similarly, to the previous model of integration, horizontal integration works via CPS, in order to log and meet all the logistics challenges continuously (the traceability, the accessibility, management of warehouses, and production). Processes are therefore more flexible in every step of the value chain. Modifications and adaptations following the customer's requirement can be made at any level.

- *Through-engineering across the entire value chain:* The third main characteristic of Industry 4.0 is cross-disciplinary through-engineering across the entire value chain and across the full life cycle of both products and customers [3]. It consists of the development of integrated and coordinated to product-life-cycle production systems that creates an optimization of the relation between the production systems and the product development. The key to this component of I4.0 is also the deep integration of data, used at every step of the value chain.

- *Acceleration through exponential technologies:* The fourth main benefit of I4.0 is its impact on flexibility, individualization, and cost savings in terms of industrial processes thanks to its ever-growing set of innovative solutions.

  a. *Autonomy*: Artificial Intelligence allows automation systems to be highly cognitive and autonomous thanks to advanced robotics and sensor technology that can perfect each individual production process.

  b. *Safety and quality*: Nanomaterials and nano-sensors allow the close monitoring of production for better quality assessment and safer collaboration of humans with next-generation robots.

  c. *Automated logistics:* The use of AI programmed machines like drones to make inventories, driverless vehicles in factories and warehouses to deliver components is particularly efficient thanks to their ability to function day and night under any weather conditions. These logistics solutions of smart factories allow for cost-cutting, flexibility, reliability, and time savings.

  d. *3D printing*: Additive manufacturing (3D Printing) brings new functionalities and higher complexity of products without additional costs and new inventory management solutions thanks to delayed differentiation of products allowing for smaller stocks, and supply chain risk pooling between different factories. There are, however, still challenges to overcome before additive manufacturing can make an impact on manufacturing sectors given the fact that this technology is still expensive and unit cost of production is high, and do not follow economy of scale principles.

2.2 Customization

The most blatant of the effects of efficiency in this modern revolution is customer satisfaction. Indeed, thanks to the advanced technologies, customers demand is well – *if not above expectations* – aligned with the market's needs and wants while remaining highly profitable for the firm.

Customization is an important issue in the global manufacturing industry, and its relevance is expected to even increase in the future. Customers want to customize the design of their products and by influencing the development and production processes at an early or even late stage. This tendency creates the need for manufacturing companies to move from the objective of better products for their customers to the objective of an individualized understanding of customer needs and specialized, industry-specific solutions [5]. That is to say, a major shift from an economy of scale to an economy of customization regardless of the location of production sites in the global value chain.

This ongoing change of customers' needs results in more and more system complexity in system design as well as in assembly. Furthermore, commissioning can only be partially compensated by manufacturers' standardization and modularization efforts. Nevertheless, *end-to-end product data modeling* from engineering to commissioning enables efficient production at locations with a global presence and supply chain, as well as, an efficient way to cope with the increasing product complexity resulting from the demand for customized system solutions [6]. One way to implement individualization in the production process is through *assembly line production systems*. Modern assembly line systems have the increasing ability to offer each customer a different product that is better suited to their needs and preferences. These assembly line systems are enormously profiting from the upcoming Industry 4.0 technologies. Moreover, this development enables the proposal of business models covering product customization, i.e., customers can change attributes of their product once production of the product has started. This business model requires manufacturing tools to be able to make decisions online and negotiate with the customer on the changes that can be made, depending on the workload flowing through the production system [7]. The ability to make changes online also reduces the disadvantages of the large geographical distance between the manufacturer and the customer caused by international business activities.

Assembly line production systems will also be affected by an increase in flexibility in production. Bortolini et al. [8] state that products produced in assembly lines will not only be able to be personalized but that late customization (i.e., after the order has been placed) will also be possible because real-time information on the status of the production process will be available. This means that customers will not only be involved in the definition and design of the product and its specifications, as is the case with mass customization products but will also be launched once in a late customization mode [9].

In contrast, mass-customized production facilities typically produce large volumes of products that share a common core but may be customized to a certain degree [9], creating production process sections with repetitive larger lots (e.g., automotive press shop) and sections of high product variance (e.g., final automotive assembly). The customers of mass-customized production factories typically customize their products based on a predefined set of configuration options, which can be integrated into a common modular architecture. Mass-customized production type factories are typical in the automotive industry, automotive Tier-1 suppliers, and, to some extent, in the truck, bus, agricultural, and construction equipment sectors. Industrial equipment manufacturers – where factories simultaneously have large production volumes and accommodate an ever-increasing number of variants – run mass- customized production type factories as well.

Therefore, the strategy of providing differentiated products leads to a paradigm change in manufacturing planning, posing new challenges for industrial activities. To satisfy the new kind of markets, industries had to adopt agile models, exploiting the competitive advantages of each organization [10]. These manufacturing models intend to face the uncertainty of the market by increasing the response capability of the

organization in order to satisfy the customers with similar costs to mass-production industries [11]. Handling the production of large amounts of customized products presents a tough challenge since product differentiation hampers scale economies.

However, managing the production of personalized or customized goods will be quite demanding, given their different requirements. Finally, when late customization of the customer is possible to be accepted and when it is not, it depends on the production sequence in execution, and when it is possible to apply to re-sequence to incorporate the late customizations. Moreover, the advantages of late customization processes can be achieved only if the system is autonomous and can keep running the fabrication process. The customer needs real-time information about the evolution of the production of its personalized product [12]. And, as Kietzmann et al. [13] comment in the context of additive manufacturing, *As with most disruptive technologies, it is likely that we will over-estimate the potential of 3-D printing in the short term while underestimating it in the long term* [13]. In particular, for manufacturing companies, it can be concluded the widespread adoption of the constituent technologies has the potential to transform the location and organization of these production firms worldwide.

2.3 Big data analytics

Before Industry 4.0, companies used traditional data sources such as production records, internal accounts, and market research reports with a limited range for their decision-making process. The way of data sourcing is changing. Data is more and more generated from sources like sensor-generated data from smart products and data from search engines and social media sites. This technological shift offers multinational compagnies (MNC) the opportunity to access new worldwide business-relevant information. Additionally, technical progression regarding computing power and data storage costs is taking place. This results in the development of big data analytics [14–16].

To understand the innovational power of big data analytics, it is important to understand the changed concept about time in comparison to data analytics before Industry 4.0. Big data analytics is looking into the future and tries to generate existing and new data sources. The traditional role of information technology has been more backward-looking and concerned with monitoring processes and notifying management of anomalies. Firms that have adopted big data analytics report improvements in productivity and financial performance. For example, analysis of big data can enable managers to identify defects, faults, and shortcomings in the production process at an early stage, optimize automation processes and carry out trend analyses, use resources more efficiently and carry out predictive maintenance [17].

The potential implications of big data analytics for international business are several. In particular, firms will be able to monitor emerging trends and opportunities in overseas markets without the need to make substantial resource commitments in those local marketing affiliates, and they will be able to optimize more effectively their supply, production, and distribution activities around the world [18]. But there are two major drawbacks. The first is that the availability of good-quality big data may well be a source of value for firms, but successful firms will require a range of technical and governance capabilities to analyze and operationalize that data so as to realize the potential benefits [19, 20]. The second is that individuals' privacy will be under threat from widespread big data applications. Like Facebook knows what we like, Google knows what we browse, and Twitter knows what is on our mind [21].

New data protection laws and/or stronger industry self-regulation will need to be formulated to safeguard the privacy of individuals and companies, and to put limits

on what data can be accessed, stored, and transmitted both nationally and across borders [22]; Rose et al. [23]. It has to be discussed who will have legal title over what, and who will bear legal responsibility for, products that involve consumer-generated intellectual property [24] and how will these issues be handled in cross-border settings? Some form of (transnational) governance regime will be necessary to regulate this dilemma between the benefits of big data analytics described earlier and data privacy. Finally, this may influence or even determine the abilities of firms to maximize the commercial potential of big data analytics [25, 26].

2.4 Environmental impact: Energy sustainability

The optimization of production and logistics processes allowed by Industry 4.0 could have a major impact on the management of the environmental crisis. Indeed, the processes of Industry 4.0 that allow energy savings and waste reductions to cut costs for firms would be equally beneficial for the preservation of natural resources and biodiversity. The Sustainable Development Goals established by the United Nations include the improvement of energy efficiency and better management of waste. Therefore, the improvements brought by Industry 4.0 would be in adequation with government environmental policies and regulations, which will most probably become much stricter in the coming decades.

Industry 4.0 allows improved production management thanks to the production monitoring capabilities of Industry 4.0. Constant monitoring of production efficiency and intelligent quality control offer great opportunities in terms of production efficiency, waste reduction, and improved reliability. Consequently, firms would have a better energy efficiency [27]. Industry 4.0 allows firms to make informed decisions based on the data-mining possibilities brought by sensors and AI. Relevant statistics on production efficiency, product life cycle, and energy consumption will be available to the firms [28]. Industry 4.0 will also connect the consumer with its energy consumption thanks to the sharing of statistics made possible by smart data communication technologies [29]. Energy consumers will be informed on their consumption, and this will promote self-responsibilities.

However, these improvements could easily be counterbalanced by the fact that Industry 4.0 requires the collection and storing of massive quantities of data in data centers, which significantly contribute to global warming. But this is not a fatality, and firms should not be stopped by this challenge, as innovative solutions allow the heat produced by data centers to be reused as a heating source. This strategy is especially used in Nordic countries such as Finland or Sweden.

3. Evolution of Industry 4.0 and implications for global business

Research on Industry 4.0 is numerous and rapidly evolving. Many types of research have addressed the evolution of the Industry 4.0 (I4.0) phenomenon and its contribution to international business activities. Especially the major drivers of I4.0 that underlines its involvement to enhance current business practices by streamlining both the production and supply chain networks [30, 31]. Those developments in Industry 4.0 have huge implications on the way the current business activities both at home as well as across the globe (i.e., international trade) are being conducted. Mamad [2] has addressed how Industry 4.0 works and has made a broad illustration of the subject in detail through an exhaustive literature review. Deloitte [3] provided an overview of the beneficial application of Industry 4.0 to enhance organizational processes. McKinsey's [6] study focused on customization and explained how Industry 4.0 has reshaped the manufacturing industry to fit

customer demand and how companies can reap profit from these upcoming innovations by showing application opportunities. UNIDO [32] report has presented an impact analysis and showed how Industry 4.0 could contribute to environmental sustainability. Jayashree et al. [33] showed how Industry 4.0 could contribute to developing dynamic capabilities and realizing triple bottom line (TBL) sustainability. Bibby et al. [34] give some tools to assess the current level of Industry 4.0 maturity of businesses that want to transition to I4.0 and better approach the issue. Dhanpat [35] reminds us of the underlying dimensions of I4.0 as a growing need for learning capacities of smart technologies to cope with the new era of cyber-physical systems. Ahmadi et al. [36] addressed the main architecture models of value-chain structure in Industry 4.0.

3.1 Industry 4.0 and international trade

Industry 4.0 brings both enormous opportunities and challenges for the industry and international trade. It helps not only to modernize the production process and self-initiated execution but also allow the managers to undertake the management of the production process across the globe by creating a flexible global supply chain.

The fourth industrialization is changing the way we perform different kinds of business activities by drawing its main components and their contribution to the business environment. Industry 4.0 is the implementation of cyber-physical systems for creating smart factories by using the IoT, big data, cloud computing, artificial intelligence (AI), and communication technologies for information communication in real-time between the man-machine and machine to machine communication which is redefining the global value chain.

According to Horvàth et al. [37], there are five key drivers of Industry 4.0: Digitalization, optimization, and customization of the production, automation, and adaptation, human and machines interactions, and collaborations, high value-added offers, and automatic exchanges of data and communication. The fourth industrialization has contributed to critical transformation to the international business environment in the different stages of an organization such as human resources, financial systems, management, organizational structure, or production processes.

Those key drivers are highly illustrated by the implementation of cyber-physical systems, the internet of things, smart factories, smart technologies, cloud computing, and big data. The latest architecture of industrialization pursues new objectives and faces completely different challenges that increase in a global perspective. Industry 4.0 offers an opportunity of restructuring declining manufacturing industry in the high-cost-country (HCC) and permit to maintain a strong industrial base in developed countries [38]. It could represent a great opportunity in the context of declining manufacturing in the developed markets. Industry 4.0 answers three key challenges: better competitiveness, flexibility, and agility by facing global offer end demand fluctuation and the regionalization of production [38]. To sum up, Industry 4.0 can be understood as multiple solutions built to change the international industrial sector to gain stronger competitive positions, market shares, especially within a risky business environment. This ambition should be realized by using smart technologies and factories that ensure efficient response to the variation of the global market by improving competitiveness and agile management, which will conduct the changes implied by Industry 4.0.

3.2 Industry 4.0 and implications for international businesses

Central to the fourth industrial revolution is an interconnected network. The internet enables many small firms to participate in global trade, thus, leading

to more inclusion. It makes it possible for more products to be exported to more markets, often by newer and younger firms. A 10-percent increase in internet use in the exporting country is found to increase the number of products traded between two countries by 0.4 percent. A similar increase in internet use of a country pair increases the average bilateral trade value per product by 0.6 percent [39]. The transformation implied by the fourth industrialization, Industry 4.0, might lead to significant changes in existing business models allowing new ways to create value. These changes are expected to result in the transformation of traditional value chains. Industry 4.0 affects three elements of manufacturing small and medium enterprises (SMEs): value creation, value capture, and value offer [37].

The 4th industrialization will completely change global value chains by transforming its practices and objectives. The purpose is not limited to monetary rewards but includes new trends such as the willingness to gain efficiency, to create and sustain global competitive advantages, finding new ways of producing, generating innovations, stimulating automation and learning, or even increasing customer implications in the production processes.

Several opportunities generated by Industry 4.0 are transforming the current business levels and activities through its drivers. Multiple business models are flourishing in the Industry 4.0 era. One of the fast-emerging models of them is the *expectation* [40]. The expectation represents a combined model in which a firm built its expertise through the production processes of its general offer. This new trend led a company to create consulting services (about products or processes) or a new platform-based model. The platformization of the product refers to a company that uses its know-how and intensive capacities of production to create digital products that answer customer queries by using a cloud-based platform. The platformization of processes reflects the use of the smart factories' concepts and internal processes to transform their capacities into a digital platform. The value created is the result of an integrated solution of digital products and related Information technologies services. The expectation gives us an illustration of how I4.0 changes our model to do business and how complex it is to put in place within an organization and will impact the current business activities. The major Industry 4.0 drivers will redefine business activities [30].

Internet of things (IoT) is retained as a pillar of I4.0. This type of technology provides access to the internet by using deep learning technologies. This equipment transforms machines into smart objects that could, for instance, detect wear, control the performance of the production process, plan the capacity or even manage stocks in real-time. Cloud computing allows interconnection between computers and the internet. It can solve many issues such as Big Data storage as well as the costs and capacities linked to this storage.

Cyber-physical systems (CPS) are mechanisms that allow Humans, software, and machines to interact. It implies an aggregate level of networking. The main purposes of this technique are, by creating such virtual interconnection, to exchange key information to make better strategic decisions. It establishes strong links between production processes, machines, and the virtual world, which work and communicate thanks to computation and the internet in real-time cooperatively. The machines and physical systems will be synchronized to software, and it will allow the control and assessment in real-time production efficiency, adjusting it and making the right strategic decisions easily. Also, CPS enhances the integration of autonomous machines and the collaboration between humans and cyber work.

Autonomous robots are created with deep learning capacities. Deep learning technological advances permit a robot endowed with artificial intelligence to adapt itself to its working environment, make adjustments that enhance its working environment, and take appropriate decisions when observing disruptive issues. This

is one of the major pillars of I4.0 that is very challenging as it can replace Human works forward and generate greater benefit for a company. Enterprise resource planning (ERP) systems are considered the backbone for the Industry 4.0 [41]. ERP systems, for instance, the systems Applications and products in data processing (SAP) software, helps companies in various areas, to manage better their processes, and enhance their efficiency by integrating its operations to increase flows of information and collaboration between the company and its partners. ERP systems help companies in many areas starting from increasing better information sharing between departments, improving workflow, better supply chain management, integrating of data, processes, and technology in real-time across internal and external value chains, standardization of various business practices, improve orders management and accurate accounting information of inventory management [42].

The result of the use of the different drivers (IoT, CPS, Internet of Service, ERP) will lead to the creation of smart factories, which brings all the smart tools and models together in its production model. This integrated system will facilitate the globalization of production and expansion of global supply chain. It is true that some of manufacturing activities might be re-shored but at the same time, the new smart technology will allow firms to reconfigure their production network overlooking the national boundaries and distance. That is the reason why it is still in the pre-paradigmatic stage of Industry 4.0. implications it is a continuous process that conducts the transformation of our current or traditional methodologies to do business and conceive industrial purposes and processes. As a result, the production model of smart factories becomes cost-effective and flexible to market changes and sustainable, which would reflect the highest level of effectiveness feasible to achieve. This newfound technological prowess will modify drivers of global production networks (GPN), reduce the importance of physical distance as well as reconfigure the global value chain (GVC). The new global division of labor (NGDL) is likely to emerge and re-distribute the manufacturing activities integrating different hubs from both the developed, emerging, and developing markets.

4. Challenging issues related to Industry 4.0

There are no doubts about the enormous challenges that Industry 4.0 will bring to the current practice of production, consumption, and global value chain (GVC). Firms and policymakers need to take into consideration adequate strategies to better implement the Industry 4.0 systems, re-organize business activities by taking into consideration of new context and take other caution for the long-term growth of the fourth industrial revolution and reap profit from it. We will define and analyze in this section the challenges raised by Industry 4.0, starting with implementation challenges, then the challenges surrounding the management of Human resources, then the risks to data security, then the Big Data challenges, and finally, the challenges concerning the environment.

4.1 Implementation challenges and inequalities

As we established earlier, the transition to Industry 4.0 brings countless opportunities for businesses to increase their efficiency and development. However, there are many barriers to the implementation of Industry 4.0, the most important lackings are the shortages of skill-sets that are required in the Industry 4.0 phenomenon. There is also a lack of experience and hindsight on the transition, the necessity to remodel the entire organization, and the coordination of data resources. Added to these challenges are the inequality between SMEs and MNCs in terms of

resources, focus, and strategies in the transition to Industry 4.0. This section will present the three main difficulties faced by firms integrating Industry 4.0.

4.1.1 Lack of experience and established models

The lack of experience is certainly one of the biggest factors that hold back the businesses from transitioning to Industry 4.0. era. Indeed, the transformation of the companies is very costly, and no clear business case is available as a reference for companies. It is very difficult to justify such investments when there is no perspective, no pattern to follow, and no successful case to reproduce. Therefore, most frequently, companies will either fail in their transition (60% rate of failure) or simply lack the necessary courage to follow through the process of radically changing their organization and investing as much time and resources.

To tackle this challenge effectively, some interesting research in the field has started to emerge, building the first tools to approach the transition. According to Bibby et al. [34], firms should begin by assessing the current level of Industry 4.0 maturity in their specific context or supply network. This analysis will help them determine their strengths and weaknesses and focus their improvement on the right area. Few academic research has been done so far in this area, and many research are done by consulting firms. As an example, in order to assess the industry maturity level of firms, two Industry 4.0 assessment models have been developed in 2016 by consulting firms, IMPULS management consulting GmbH (IMPULS) and PWC. While the PWC model helps companies self-assess their level of maturity based on various criteria, the IMPULS model is focused on delivering improvement advice based on the company's preparation. More of these models are currently developing, showing that the challenge of the lack of experience will likely be overcome with time as Industry 4.0 spreads across the manufacturing world.

4.1.2 The cost of restructuring the firms

The transition to Industry 4.0 from a traditional organization requires the restructuring of the entire organization, as tasks are automated and decision-making processes are programmed. Every firm that will adopt Industry 4.0 system. We will have to create new business models and define a new strategy. Indeed, this transition requires rethinking the whole organization and processes, interconnecting departments, buying new equipment or modernizing the existing one, reassigning roles to employees, recruiting new operators, and many other disruptions of their current model. These major changes have a great cost for any business on many levels: financially, of course, but also in terms of time. Therefore, firms have to be especially careful when investing in these transitions in order to not fail its implementation of Industry 4.0.

4.1.3 Advanced coordination across the firms

Another challenge of the implementation of Industry 4.0 is how to connect all data efficiently. Industry 4.0 requires the cooperation of all organizational units, from manufacturing, R&D, IT, to sales and finance departments. Sometimes the walls separating these departments are very hard to break, adding to the difficulty of the transition. But the coordination of functions is only part of the issue: Industry 4.0 requires the management of the large quantities of data generated by diverse sources in the company. For example, production data will have to be processed and coordinated along with data from customer information systems.

Data Integration is, therefore, a very difficult task, and the firms need to have the necessary talent from data scientists that will be able to process and model this data.

4.1.4 Inequalities for SMEs compared to large firms

More than 98% of firms in the developed markets are considered as SMEs, and they are increasingly participating in the global value chains and global trades of goods, services, and components. Introducing the new I4.0 paradigm may have varying levels of difficulty depending on the size and available resources of the targeted firms. Starting conditions between Small and Medium Enterprises (SMEs) and larger firms are obviously very different and bring different challenges. According to Matt et al. [43], SMEs need specific strategies to properly implement I4.0 to their business model.

Large companies will usually follow the higher maturity level in the technological domain faster and more easily than SMEs because of the resources. Indeed, they have more money, expertise, and time to invest in this project. As a consequence, I4.0 is spreading more quickly across large companies which are investing and working intensively on introducing and enabling the necessary technologies. SMEs, however, are lagging behind because they lack the financial and human resources to research into the risks and potential of implementing I4.0. These difficulties further enlarge the gap between SMEs and large multinational companies. However, SMEs have an advantage over large companies, which have a much more complex organizational structure and production processes. Therefore, it is much easier to implement the necessary changes to the organization and culture of SMEs.

4.2 Human resources challenges

According to the study made by Glass et al. [44], across 176 SMEs and 71 large enterprises, numerous barriers to Industry 4.0 must be underlined across business processes and models. The most important challenges include, of course, the multiple issues which arise from Industry 4.0 strategy modeling and the growing need for highly skilled workers with specific know-how, particularly oriented in high technologies, smart engineering, automation, and digitalization competencies and expertise, etc.

We can easily understand that, beyond such technical and future-oriented subjects applying to industries, which is already developed in multiple kinds of business corporations, human resources remain a major challenge for the spread of Industry 4.0 concepts, methodologies, models, and tools. For instance, Mubarak and Petraite [45] have raised a fundamental HR component of Industry 4.0 implementation: The concept of digital trust. Digital trust is situated between trust and Industry 4.0 implementation and implies HR issues. We can identify major human resources issues related to Industry 4.0 as the followings:

4.2.1 The dangers of the technocentric approach

When digital trust refers to a new working environment where technology and Humans interact for the welfare of a company and to answer the stakeholder's needs, a danger of this approach would be the growth of technocentric businesses. In fact, in this model, the stakeholders will give more confidence to technologies, artificial intelligence, and automation to run their business activities and corporations rather than human beings. Indeed, The Deloitte reports questioned the

preparedness of HR in an era of Industry 4.0 and the global value chain. Among the 32% of firms that are ready to face technological challenges, only 12% are ready to face the challenges emanating from the Industry 4.0 ecosystem [46]. This statistic illustrates the new trends for companies to focus on efficiency with the highest technological implementation rather than hiring people and maintaining their position through retention policies.

4.2.2 The digital transformation: The increase of ISHR, ARP systems, and ERP

The information systems of human resources (ISHR) illustrate the Industry 4.0 impact upon Human resource function. Indeed, the ISHR technologies permit to automate, standardize with the intervention of smart technologies, activities that belong to HR functions as the following ones: Administrative procedures, training, payrolls management, recruitments, talents management, or even career development of employees within a company [47, 48]. The different systems like automation of robotic processes (ARP) and enterprise resource planning (ERP) were conduct to rethink the HR function. Those different tendencies push HR workers to acquire new competencies geared towards smart technologies and which are transforming their workstation, and which are implying news risks. On the one hand, we can identify the complexity of adaptation to the rapid change of HR function but also the risks linked to the security of information systems and the possibility to lose sensitive data to the benefit of the competition. As a reminder, ISHR systems such as the one proposed by the SAP software can contain confidential data such as the wages, the positions, the personal data of each employee, their curriculum vitae, the annual reports, information posted on the different job board and the main partners of the company, etc.

4.2.3 The recruitment, retention, and attraction of new talents

The fourth revolution required a highly-skilled workforce to be implemented, developed, used and maintained. As a result, a wide range of industries needs a certain level of cooperation between machines and workers. If Industry 4.0 implies this tendency, it also underlines the growing trend of Google, Apple, Facebook, Amazon, Microsoft (GAFAM) to conquer traditional industries in which they have the necessary knowledge and capacities to become undisputable competitors in multiple fields [49]. As an example, we can remember the creation of the Google autonomous car, the collaboration between the Volkswagen group with Amazon web services to collect and analyze its industrial data and becoming a major global leader of the automotive industry, and even the collaboration between Apple and General Electric (GE) to create new applications for the internet of things (IoT) platforms that benefit to GE industries purposes thanks to IOS (exploitation system owned by Apple) opportunities. Industry 4.0 increases competition, in traditional industries and markets (but not only), which seems to be overwhelmed regarding the fast spread of the fourth industrial revolution. To overcome these challenges, companies must recruit high skilled workers, implementing continuous reskilling, learning, and training programs in their HR policies [44]. Besides, one of the major HR issues is constituted by the launch of retention practices which will reduce the diffusion of confidential business information and enhance efficiency and profitability by staying competitive at the same time. We can understand that the rise of high skilled workers' demand would create a danger if it is not associated with HR policies to enhance workforce abilities to work in a new smart and autonomous workplace.

4.2.4 The adaptation to change

One major issue to face urgently for HR function is the resistance to change. According to Deloitte [50] report, 17% of their interviewees are ready to manage working environments composed of people, robots, and AI interacting together when 60–70% will fail because they do not manage the adaptation to change properly. Also, Dhanpat et al. [35] confirmed this problem. They have shown that some employees can be resistant to change by being afraid of losing their jobs and being replaced by machines. Bonekamp et al. [51] also agree on the fact that the introduction of Industry 4.0 led to the suppression of standardized tasks by smart and autonomous systems. As a consequence, strong pressure is put on HR managers who require highly skilled people, to train employees and manage to dismiss workers for whom their tasks will be replaced by smart technologies to gain efficiency and competitiveness in the global market. In 2016, The World Economic Forum (WEF) already raised awareness by making an announcement before the opening of the Davos forum: around 5 million jobs in 5 years will be suppressed within 5 years in the main global economies [52]. It is necessary for the HR function globally to answer and react to the exponential expectations of the fourth industrial revolution by taking into account its effect on the global workforce demand and its impact on the global economy and competitiveness.

4.3 Big data challenges (storage, RGPD, societal challenge)

The fourth industrialization reveals new challenges in business activities such as the management of Bigdata and cybersecurity. Multiple obstacles to Industry 4.0 remain redundant: The constraints are numerous because the digitization of the industry poses formidable problems of standardization and cybersecurity [52].

Indeed, through their researches, one of the major challenges implied by this concept in the working environment is the deployment of Big Data, which creates a growing need to provide a legal framework for the protection of personal data and private life. Among the different cyber issues reported in Industry 4.0, the Deloitte report [50] identifies the top 10 cyber threats and their major data protection concerns.

Indeed, if legal restrictions increase to manage big data challenges, the different issues persist. In terms of an international legal framework, the ISO norm ISO/IEC 27001 defines the data security management for sensitive subjects such as financial, intellectual proprietary, employees, or even data entrusted to another company in the context of business activities. This norm is also called "Management systems of Information security" [53]. In addition, the European Union has implemented the General Data Protection Regulation (GDPR) to mitigate different kinds of challenges affiliated with the management of Big Data. GDPR regulations refer to "imposing a legal framework on the processing of personal data" [54].

However, despite the willingness to build an international legal framework to reduce risk related to Big data cybersecurity, there are still a long-ways to go for a proper framework of Industry 4.0. For instance, Deloitte report has shown that one out of four firms is not developing, implementing, or documenting the industrial cybersecurity (ICS) specific policies and procedures, and more than 33% of manufacturers have not performed any cyber risk assessments specifically focused on the ICS operating on their shop floors, resulting in a potentially significant risk to their operations [55].

In terms of internal management, other issues can arise when a company starts using big data analytics in order to grow. The challenges to take into account include the lack of proper understanding of big data, and therefore, proper usage of the latter; data growth issues, or, "what do I do with this much information?" because

the collection of such an amount of data must be useful for something. But what, exactly? Another issue is the confusion when selecting a Big Data tool. There is an increasing number of tools available on the market for firms to have reports and data concerning their businesses. However, it is often not very precise and easy when one is not really aware of what is best for them. This last point brings us to another issue which is the lack of professional expertise in the field of Big Data. Indeed, more and more companies are recruiting professionals and experts in the field of data, such as data scientists, engineers, and analysts. These professions are rare, and as the demand and supply rule confirms, it is quite costly for a firm to recruit, though it is a must when expecting to grow, especially in our current globalized market.

5. Strategies of Industry 4.0 implementations

Concerning the international strategies of Industry 4.0 applied to firms, we can find key references in terms of Smart Manufacturing architectures: Reference Architecture Model or Industry 4.0 (RAMI 4.0), Smart manufacturing ecosystem (SME), Intelligent manufacturing system architecture (IMSA). In Smart manufacturing, the architecture corresponds to the designing of the arrangement and connectivity of the organizational structure. The Smart manufacturing ecosystem (SME) provides a standard overview of Smart Manufacturing Systems (SMS). It has three dimensions: product, production, and business. It allows information circulation, in order to follow the production of products through its entire life-cycle. It focuses on the entire value chain and the interaction between the three dimensions. *Each dimension comes into play in the vertical integration of enterprise systems (ERP), manufacturing operations management (MOM), and cyber-physical production system (CPPS)* [36]. The IMSA is *a 3D intelligent manufacturing system framework, consisting of life cycles, system hierarchy, and intelligent functions*. It takes into account the standards and features of all intelligent manufacturing systems to a framework with key dimensions: Lifecycle, to represent the chain integration; system hierarchy, to control, workshop, enterprise, and cooperation levels; and finally, Intelligent Functions which illustrate *resources, integration, interconnection, information fusion, and new business patterns,* [36].

According to a BGC report on Industry 4.0, related to the German manufacturing industry, Industry 4.0 will be used by an increasing number of firms and generate significant productivity gains of this industry sector (90 to 150 billion EUR). The productivity will improve by 15 to 25%. If material costs are considered, productivity upgrades of 5 to 8% are realistic. Individual effect size depends on the specific manufacturing industry. E.g. industrial component manufacturers will see the largest productivity gains (20 to 30%), while automotive manufacturers may assume 10 to 20% [56]. Furthermore, Industry 4.0 will impact the revenue growth of the German industry. Need from manufacturers for improved devices and new data applications, as well as customer demand for a greater range of increasingly customized products, will provide further revenue growth of around 30 billion euros per year, equivalent to around 1% of German GDP.

The BCG study predicts that the growth and productivity increase described above will also positively impact the employment growth of 6% over the next decade. The need for mechanical engineering workers could increase even more – by up to 10 percent over the same period. In the next few years, the automation trend will replace some low-skilled workers in repetitive and monotonous tasks. However, the increasing use of big data analytics will increase the demand for workers with ICT skills. This shift of needed skills transformation is one of the most important challenges of future growth and innovation. Making the mandatory steps

to be economically successful in the world of Industry 4.0 will cost manufacturers about 1 to 1.5 percent of their sales in absolute value over the next decade. Finally, it can be concluded that Industry 4.0 will transform the global value chain, labor market, and logistics.

6. Conclusion

Global trades are going through lots of volatility from geopolitical instability and natural disasters. The current situation requires businesses to develop their strategic goals for growth, risk management, and global supply chain for the short term, mid-term as well as long term. Manufacturing firms need to develop multi-pronged and multi-disciplinary approaches to address challenges facing current and future supply chain disruptions. The use of advanced technologies like artificial intelligence (AI) and Business analytics can be helpful to analyze large-scale data and keep track of supply chain movements in real-time and develop the ability to re-configure the Supply chain on short notice. A firm's ability to succeed in global markets will depend on the capacity of the industry to adapt to a rapidly changing business landscape.

To sum up, Industry 4.0 seems to have reached heights when it comes to the organization of enterprises at a global level. We described how international organizations could benefit from Industry 4.0 doing international business. We explained how the components of Industry 4.0 had enhanced many aspects of SMEs and MNCs, by analyzing the evolution of the different phases of the historical context to come to such a strong, advanced stage. We, therefore, defined the industry and its key components to explain its contribution to the organization.

Managers need to develop the ability to identify the opportunities and the strengths brought up by this industrial revolution. We took a look into its efficiency features, and opportunities to satisfy the varied demands thanks to capabilities of customization, and the power of the use of Big Data Analytics, as well as the great impact that this evolution has on the environment. Nevertheless, all these benefits do not come without some challenges. Indeed, Industry 4.0 has full of potentialities of innovation and quite complex transformations to simplify and adapt organizations, especially in terms of human resources because robotics and automation will have huge a repercussion on the social aspect. Most especially, developing and emerging countries that participate in the global value chain by offering advantageous manufacturing production locations will face stiff competition between Industry 4.0 based technologies with those of cheap and abundant labor force in those countries. There is no option other than up-grading the workforce and integrating into the 4.0 era to face these new challenges in the era of Industry 4.0. Finally, as valuable as Big Data can be for the industry, we have found out that it is still a domain that requires particular attention since its use remains quite laborious.

Nonetheless, this modern revolutionary phase is not the last of its category. In fact, the very recent rise of Industry 5.0, a solution provider for people and the planet has flipped the script. Indeed, the new revolution of Industry 5.0 puts an emphasis on the well-being of the workers and captures all the added-value components of Industry 4.0 with the aim of prosperity in the new industry as an ambition for a better future.

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Chapter 3

Does the Interaction between ICT Diffusion and Economic Growth Reduce CO2 Emissions? An ARDL Approach

Ismahene Yahyaoui

Abstract

In recent years, information and communication technology (ICT) and its impact on economic growth and CO2 emission has become a hot topic of debate; however, little research has been conducted regarding the impact of the interaction between ICT and economic growth on CO2 emission. The study tries to evaluate empirically the impact of ICT and economic growth on CO2 emissions of Tunisia and Morocco for the period 1980–2018, based on the Auto-Regressive Distributive Lag (ARDL) analysis. Findings demonstrate that ICT and economic growth affect positively and significantly the CO2 emissions in the short and long term in both Tunisia and Morocco; however, the direct and positive effect of economic growth on CO2 emissions can be ameliorated by introducing the interaction between ICT and economic growth. The Toda-Yamamoto Granger causality test reveals that bi-directional causality is running between economic growth and CO2 emissions in both countries. On the other hand, our obtained results express that there is a unidirectional causality running from ICT to CO2 emissions in both countries. So, the promotion of ICT can be considered one of the important strategies introduced to mitigate CO2 emissions. Then, introducing green ICT projects in various sectors of an economy is a better choice for policy makers to decrease the CO2 emissions.

Keywords: economic growth, ICT, CO2 emissions, Tunisia, Morocco, ARDL

1. Introduction

In recent decades, climate change has been regarded as the most challenging environmental problem of our time and has attracted the attention of international organizations, policy makers, and researchers. In this context, this article aims to examine the relationship between economic growth, ICT, and CO2 emissions.

From a theoretical point of view, the study of the environmental quality-economic growth relationship began during the second quinquennium of the 1980s. Several studies (Grossman and Krueger [1]; Pearce and Warford [2]; World Commission on Environment and Development [3]) emphasized the importance of integrating environmental concerns into the planning process in order to ensure sustainable development. Thus, these researches are the first to use the concept of EKC (the environmental Kuznets curve). These

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researches have shown the existence of an inverted U-shaped relationship between economic growth (measured by the increase in per capita income) and certain indicators of environmental quality. In other words, economic growth negatively affects environmental quality by generating more polluting environment, whereas after a certain threshold, further improvement in economic growth contributes to improving the quality of the environment. Thus, the validity of this assumption depends on the short- and long-term impact of GDP on CO2 emissions. Then, the EKC is accepted if the coefficient of the income indicator, in the short term, is higher than that in the long term. Moreover, this hypothesis can be tested by integrating the GDP and the square of the GDP in the same model. In this case, the EKC is accepted if the GDP coefficient is positive and the GDP squared coefficient is negative. Thus, environmental degradation may decrease in the long run as incomes become sufficiently high. So, on the face value, one solution to the problem of environmental degradation is to improve economic growth [4].

In recent decades, information and communication technologies (ICT) have ameliorated the quality of life by becoming one of the important pillars of society. In fact, ICT has an impact on economic prosperity [5, 6] and economic growth process [7, 8].

The rapid increase in information and telecommunications technologies (ICT) contributes to various sectors of an economy. However, the impact of ICT on CO2 emissions cannot be ignored [9–13].

For the role of ICT on ameliorating the impact of economic growth on CO2 emissions, Danish et al. [14] showed that the interaction between ICT and GDP mitigates the level of pollution.

There are a large number of papers empirically examining the issues of the impact of ICT and economic growth on environmental quality and the impact of economic growth on CO2 emissions using the tools of econometric analysis. However, studies on interaction between ICT and economic growth-environmental quality nexus is still limited. So, the objective of this study is to examine the effect of ICT on CO2 emissions by integrating economic growth for the case of Tunisia and Morocco. The study presents new features of the interaction of ICT and economic growth. In other words, we will try to examine how ICT can ameliorate the impact of economic growth on CO2 emissions.

The study contributes to the specialized literature in at least three ways. First, we examine the short-run and the long-run relationship between ICT and economic growth using ARDL models, while other previous empirical studies have neglected the panel cointegration and the long-run relationship between these two variables. Second, we study the effect of ICT and environmental quality using four different measures of ICT (mobile subscriptions, fixed broadband subscriptions, fixed-line subscriptions, and the Internet), while other previous empirical studies have used only one or two measures of ICT.

In other words, the study allows us to assess the responsibility or the contribution of each measure of ICT in mitigating the CO2 emissions. Finally, our research focuses on the Tunisia and Morocco countries, while after our knowledge, there are only a few studies, especially recent, which are focused on the MENA countries, and which have analyzed the impact of ICT and economic growth on the environmental quality. This study is presented as follows: Following the introduction, Section 2 presents a spatial study: a comparative analysis between Tunisia and Morocco. Section 3 presents the data and the model employed in this paper, respectively. Section 4 provides the empirical findings. In Section 5, some concluding remarks and policy recommendations are made.

2. Literature review

Empirically, the impact of ICT and economic growth on the environmental quality has received a great attention by scholars and policy makers during the past few years. However, studies on interaction between ICT and economic growth-environmental quality nexus is still limited. The nexus between technology and CO2 emission is a hot issue of debate over the last three decades. In the following section, we present the association between growth and ICT and the environmental quality. Also, we provide a survey on the effect of the interaction between ICT and economic growth on CO2 emissions.

2.1 ICT-CO2 emissions

The first stream of existing literature provides a wide range of studies with mixed results on ICT and environmental quality. For the influence of ICT on CO2 emissions, it differs from a study to another and from a country to another. For instance, AñónHigón et al. [15] conclude that, in the short run, ICT worsen the environmental quality; however in the long run, it improves through controlling CO2 emissions. In addition, Tamazian et al. [16] argues that well-developed financial systems affect positively the economic growth which leads to improving the industrial pollution. Also, Lee and Brahmasrene [17], using a panel of ASEAN countries, suggest that ICT affect positively and significantly the economic growth and CO2 emission. Besides, Malmodin and Lunden [18] demonstrate that the relationship between ICT usage, carbon emissions, and electricity consumption is positive and significant.

However, the second stream conclude the negative relationship between CO2 and ICT. In fact, Ollo-López and Aramendía-Muneta [19] confirm that ICT helps to decrease CO2 emissions. Besides, Coroama et al. [20] found that the ICT reduce the CO2 emission, especially the greenhouse gasses (GHGs). Recently, using the pooled mean grouped (PMG) method, Salahuddin et al. [21] also revealed that Internet use has a significant long-run relationship with CO2 emission in OECD countries. More recently, analyze the nexus between ICT and CO2 emissions in the case of 44 sub-Saharan African countries employing GMM model. Conclude that ICT has a significant impact on CO2 emission; but, when the square of ICT increases, the level of pollution mitigates. Also, a study done by Salahuddin et al. [21] confirms that economic growth, financial development, and trade decrease the level of CO2 emission. Similarly, using a panel of 12 Asian countries, Lu [22] analyzes the impact of ICT, financial development, energy consumption, and economic growth on environmental quality. He shows that the use of ICT decreases CO2 emission; but economic growth, financial development, and energy consumption increase CO2 emission. A study by Hart [23] also highlighted a negative relationship between ICT and the overall quantity of carbon gas emitted. In addition, Ozcan and Apergis [10] and Lu [22] observed that ICT reduced carbon emissions. Malmodin and Lunden [24] also proved that ICT led to a decline in carbon emissions in the entertainment and media sectors globally during the period from 2010 to 2015.

However, others researches examine the impact of ICT on CO2 emissions and found a nonsignificant relationship between these variables. In fact, Amri et al. [25] found a nonsignificant impact of ICT on CO2 emissions in the case of Tunisia over the period 1975–2014. Gelenbe and Caseau [26] also revealed that the effect of ICT on carbon emissions is mixed. This effect is influenced by the economic sectors involved. Similarly, Al-Mulali et al. [27] conclude that ICT measured by

the use of internet reduced CO2 emissions in developed nations, while the effect is insignificant in developing countries. Moreover, Zhang and Liu [28] conclude that ICT decreases the carbon emissions in the case of China over the period 2000–2010. This effect was found to be insignificant in the western region, while it was greater in the central region as well as in the eastern region.

2.2 CO2 emissions-economic growth

The second stream of existing literature provides empirical evidence on the relationship between economic growth and environmental quality. The context of economic growth in the region raises the question of the environment in the EKC hypothesis. This hypothesis stipulates that there is a positive relationship between income and CO2 emissions until an income threshold is reached, and after this level the correlation between these two variables becomes negative, i.e. when the income increases, CO2 emissions decrease. There are numerous studies testing for the causal link between carbon emissions and economic growth. In fact, Apergis and Payne [29], applying FMOL S model and Granger causality test in the case of six Central American countries, confirm the validity of environmental Kuznets curve (EKC). In addition, Pao and Tsai [30] aimed to explore the causal relationship between energy consumption, CO2 emission, foreign direct investment, and growth in the BRIC countries and Ukraine. The author found that exist a strong positive bi-directional causal relationship between these variables. Similarly, Narayan and Popp [31] aimed to explore the validity of the Environment Kuznets's Curve (EKC) hypothesis for 93 countries over the period from 1980 to 2004. Narayan and Popp [31] confirmed the existence of the long-run relationship between energy consumption and real GDP. Dogan and Turkekul [32] arrived at the same conclusion, using Bounds cointegration model and Granger causality test in the case of USA. However, Katircioglu and Katircioglu [33] found no evidence to support the existence of the EKC in the case of Turkey. Similarly, in a study for Malaysia over the period 1980–2009, Ozturk and Al-Mulali [27] failed to confirm the validity of the EKC. Similarly, Al-Mulali et al. [27] and Shahbaz et al. [34] confirmed the no validity of the EKC hypothesis over the period 1981–2011 and 1976–2016, respectively. There are a large number of papers empirically examining the issues of the impact of ICT and economic on environmental quality using the tools of econometric analysis.

2.3 Interaction between ICT and GDP-CO2 emissions

Studies on interaction between ICT and economic growth-environmental quality nexus is still limited. In this context, Danish et al. [14], using an AMG estimations models over the period 1990–2015, conclude that ICT and GDP stimulate the CO2 emissions. However, the interaction between GDP and ICT mitigates the level of pollution in emerging countries. Similarly, Tsaurai and Chimbo [11] examine the impact of ICT on CO2 emissions using different analysis methods (FMOLS, DOLS, fixed effects, and random effects) in emerging economies. He explores that ICT increase carbon emissions. But he concludes that the interaction between ICT and economic growth, in first hand, and the interaction between ICT and financial development, in second hand, reduce the carbon emissions.

3. Spatial study: a comparative analysis between Tunisia and Morocco

The use of Information and Communication Technologies (ICT) is an essential factor for the emergence of the knowledge society and can actively contribute to

human development, the improvement of social cohesion and the growth of the national economy.

The International Telecommunication Union (ITU), United Nations Development Agency specialized in information and communication technologies, has measured the development of information and communication technologies (ICTs) in 176 countries. The ITU report is the most reliable data collection and analysis, measuring the overall level of ICT development in the world through 11 indicators divided into three axes: access to ICT (including the number of fixed or mobile phone subscriptions per 100 people or international Internet bandwidth (bits/s) per Internet user), the use of ICT (for example the percentage of people using the Internet or the rate of fixed or mobile broadband subscriptions per 100 people), and finally, ICT skills (including the adult literacy rate or the higher enrollment rate).

At the Maghreb scale, Tunisia comes in second place behind Morocco (89th) in 2017 and ahead of Algeria (106th) and Mauritania (133rd), Libya not being ranked.

In Morocco, the telecommunications sector has undergone various changes that have contributed to its development: setting up the regulator, introducing new operators to the market, granting licenses ...This brief history presents some key dates of the evolution of the Moroccan telecommunications sector. The Internet pool (fixed and mobile) reached 17.06 million subscribers, bringing the Internet penetration rate to 50.4%. This park recorded an evolution of 17.9% over 1 year. Outgoing mobile phone traffic slightly exceeded 14 billion minutes in the fourth quarter of 2016.

- Mobile telephony is widespread for almost all households (99.52%) in both urban areas (99.55%) and rural areas (99.49%). It is used to access the Internet by 92.9% of individuals equipped with smartphones.

- The household equipment rate for fixed telephony has fallen over the past six years. Indeed Morrocco recorded a rate which is equal to 21.8% in 2016.

- In 2016, 54.9% of households are equipped with computers/tablets, stagnating compared to 2015; 86.5% of households are equipped with Internet with 77.2% of households in urban areas and 51.3% in a rural area (**Figure 1**).

Morocco is moving in its development and modernization strategies towards the massive use of information and communication technologies (ICT) as a crucial lever for the creation of economic and social added value.

On the menu of this conclave are a series of lectures, keynotes, as well as training sessions able to reinforce the place of this forum as a place of exchange par excellence around a rapidly changing industry, allowing a real immersion in innovative technologies namely "identification system," "new payment channels," "digital banking," "mobile payment," "e-commerce."

Regarding Tunisia, it ranks 99th out of 176 countries in terms of ICT development in 2017, with a score of 4.82/ 10, thus falling by 4 positions compared to 2016, during which it was ranked 95th and had a score of 4.7/10. We therefore notice an improvement in the score.

Regarding the 3 aspects of ICT, at the level of access, Tunisia scores 5.11 / 10 compared to a world average of 5.59/ 10. On the side of use, it achieves the score of 4.11/ 10 for a global average of 4.26/ 10. For the "Skills" aspect, Tunisia gets the score of 5.67/ 10 for an average of 5.85/10.

At the level of the Arab countries, Tunisia ranks ninth out of the 19 countries studied, preceded by Kuwait (71st) and Jordan (70th), followed by Morocco, Algeria, Egypt, and Libya, which rank respectively 100th, 102nd, 103rd, and 115th globally.

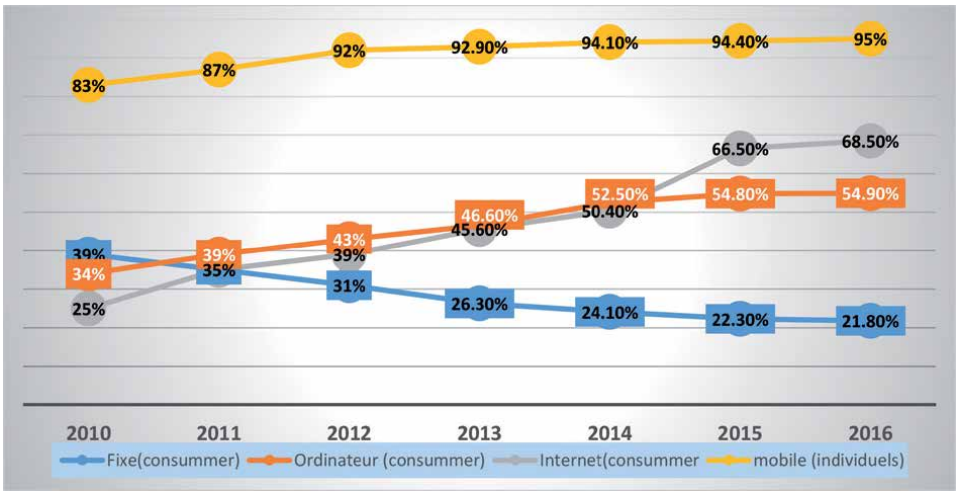

Figure 1.
Evolution of ICT equipment of individuals and households (2010–2016) in Morocco. Source: ANRT-2016 annual ICT market survey.

Representing 11% of the GDP of Tunisia, a net exporter of computer software and services for TD 1000 million in 2017, the ICT sector is experiencing a start to the year 2018 on the heels of the momentum.

For example, last February, Arab Soft brought a 365.714 DT contract to the El Ghazela ICT division for the acquisition and implementation of an integrated software package. In the same month, the BITS Informatique company won a contract from the Tunisian Ministry of Social Affairs in the amount of 624,940 DT for the acquisition and implementation of IT solutions for hosting, for itself and the organizations under his supervision. Another SSII was awarded a project to acquire a set of budgeting, auditing, and business intelligence solutions for the amount of 250 thousand euros (750 thousand DT).

For the CO2 emissions, Tunisia and Morocco are trying to control pollution through its National Environmental Control Agency. However, these countries are dispersed throughout the middle of the 2018 global rankings, with Morocco (54th) leading the regional rankings and Tunisia (58th).

Figures 2 and **3** show the positive trends of CO2 emissions and GDP in the majority of the years studied in both countries. A positive relationship could be expected from the co-movements of CO2 emissions and GDP.

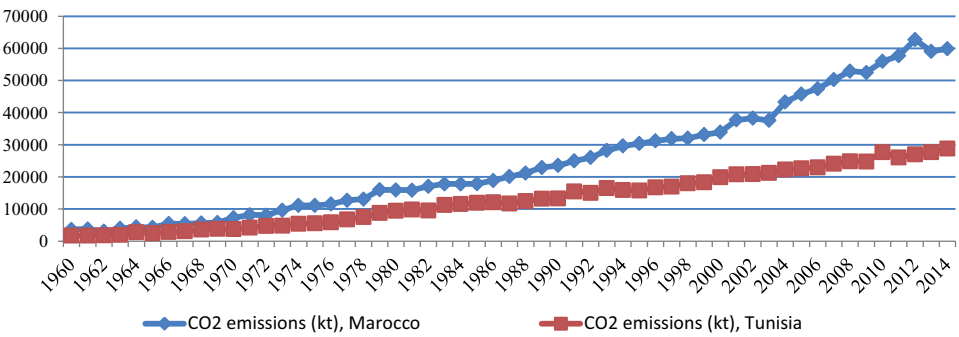

Figure 2.
Evolution of CO2 emissions (KT) (2010–2016) in Morocco and Tunisia. Source: Compiled from the World Bank database.

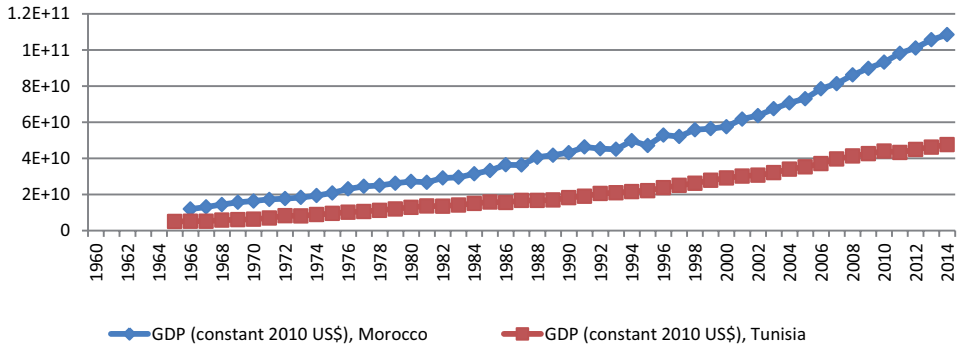

Figure 3.
Evolution of CO2 emissions (KT) (2010–2016) in Morocco and Tunisia. Source: Compiled from the World Bank database.

4. Data, model, hypotheses, and methodology

4.1 Data, model and hypotheses

The empirical investigation aims to examine the role of ICT in reducing the impact of GDP on CO2 emissions using an ARDL model in the case of Tunisia and Morocco over the period 1980–2018. To do this, we will estimate, on first hand, the direct impact of GDP on CO2 emissions. Therefore, the representation of our models is illustrated:

$$CO2_{it} = \alpha_0 + \alpha_1 GDP_{it} + \alpha 2X_{it} + \varepsilon_{it} \quad (1)$$

$$CO2_{it} = \alpha_0 + \alpha_1 ICT_{it} + \alpha 2X_{it} + \varepsilon_{it} \quad (2)$$

Where i represents each country in the panel and t indicates the time period; **CO2** refers to the CO2 emissions; **GDP** is the GDP per capita growth (annual %); X refers to the explanatory variables that are: **inf** is the Consumer price index (2010 = 100); **find** is the Domestic credit to private sector (% of GDP); **trade** is the sum of Imports of goods and services (% of GDP) and Exports of goods and services (% of GDP); **invst** is the Gross fixed capital formation (% of GDP).

The expected sign of GDP is positive because economic growth accelerates the level of pollution while the level of CO2 emissions increases (Danish et al. [14]). The expected sign of $\propto_1$ should be positive. This is essential because with the increase in GDP, people consume more goods; more industries develop so the level of CO2 emissions increases.

On second hand, we will estimate the direct impact of ICT on CO2 emissions. So, in order to study the nature of the relationship between ICT and CO2 emissions, we include ICT proxies, namely, **mcs** is the Mobile cellular subscriptions (per 100 people); **fbs** is the Fixed broadband subscriptions (per 100 people); **fts** Fixed telephone subscriptions (per 100 people); **internet** is the Individuals using the Internet (% of population).

Finally, we study the impact of the interaction between ICT and economic growth on ameliorating the environmental quality. So, we will introduce each time the interaction between GDP and one of the measures of ICT. The inclusion of these interactions allows us to examine whether growing economies are increasing the use

of ICTs in different sectors to expand economic activities. We then try to examine whether the increased use of ICTs with growing economic growth positively or negatively affects environmental quality.

So, the representation of the models is illustrated:

$$CO2_{it} = \alpha_0 + \alpha_1 GDP_{it} + \alpha_2 ICT_{it} + \alpha_3 GDP * ICT + \alpha_4 X_{it} + \varepsilon_{it} \quad (3)$$

Hypotheses

1. GDP has a destructive effect on environmental quality; in other words, GDP has a positive impact on CO2 emissions.

2. ICT moderates the adverse effect of GDP on environmental quality.

4.2 Methodology

In order to empirically examine whether ICT and economic growth have an effect on CO2 emissions in Morocco and Tunisia, and whether the interaction between ICT and economic growth affects the environmental quality, we applied an Autoregressive Distributed Lag (ARDL) model. This approach is proposed by and subsequently it was modified by introducing the bounds testing approaches. This technique is effective for many reasons. Firstly, it examines the short- and long-term relationships between the different variables that do not have the same order of integration. Secondly, it can solve the problems associated with autocorrelation and omitted variables. Finally, this approach can be useful for a small sample size application.

Before the data are further analyzed, it is necessary to demonstrate the stationarity of all variables. In fact, in order to arrive at robust empirical results, all estimated variables should be non-unit root. In this case, we use four unit root tests Augmented Dickey-Fuller (ADF), Phillips-Perron (PP 1988), Dickey-Fuller GLS (DF-GLS), and KPSS (Kwiatkowski-Phillips-Schmidt-Shin) unit root; whose critical threshold is 5%, and with a null hypothesis (H0) of non stationarity of the variable. The ARDL bounds test is based on the assumption that the variables are I(0) or I(1). So we use the unit root tests in order to make sure that the variables are not I(2) because if variables are I(2), we cannot interpret the values of Fi statistics provided by.

The next step is to test the presence of cointegrating relationships among the variables. To do this, we use the bounds test that is mainly based on the joint Fi statistics whose asymptotic distribution is non-standard under the null hypothesis of no cointegration. Once cointegration was established, we estimate the long- and short-run relationship between ICT, economic growth, and CO2 emissions using ARDL model. In order to obtain the dynamic parameters in the short run, we estimate a correction error model associated with long-run estimates (Odhiambo [35]). The short-run causal effect was represented by Fi statistics on explanatory variables, while the t statistic on the lagged error correction coefficient represents the causal relationship in the long run.

Finally, we examine the causal relationship between ICT, economic growth, and CO2 emissions using Toda-Yamamoto Granger causality test. This method is based on the estimation of augmented VAR model (k + dmax) where k is the optimal time lag on the first VAR model and dmax is the maximum integrated order on system's variables (VAR model). To do so, it is necessary, firstly, to determine the integration order for each series using AIC and SC criteria. If the integration order is different

we get the maximum (dmax) and we create a VAR model (VAR (k + dmax)) on series levels regardless of integration order that we found. However, if we have the same integration order, we continue on cointegration test using Johansen methodology.

5. Results and discussion

Before applying dynamic ARDL simulations, it is crucial to demonstrate that any series are not I (2). The Unit root test results reported in **Table 1** indicate that the variables are integrated either in levels or at first differences. So, the estimated results of the unit root tests confirm that dynamic ARDL model can be applied with the used series.

5.1 The direct effect of ICT and GDP on environmental quality

First, we will select the required number of lags of dependent variable and the regressors by applying the information criteria such as Criterion (HQ). Second, the estimation of the model should be carried out based on the number of lags.

According to the results obtained from the AIC and HQ information criteria, one lag is the optimum number to be incorporated in the analysis.

To examine the direct impact of ICT and GDP on CO2 emissions both in Tunisia and in Morocco, we will estimate Eqs. (1) and (2). So, we will find for each country five regressions. In the four first regressions, we examine the direct effect of ICT on carbon emissions, so, we will introduce each time one of the four measures of ICT in Eq. (1). In the last regression, we will introduce in Eq. (2) the variable GDP in order to examine the direct impact of GDP on environmental quality.

To test the cointegration of variables, the ARDL bounds test was used. This test was used to check the long-term relationship among the study series. **Table 2** indicates the results of F-statistics which is applied to decide the cointegration. The calculated F-statistics value is greater than the upper bounds value at 10% and 5% level of significance that indicates that cointegration exists among the study variables, in both Tunisia and Morocco for all our models.

This section consists of describing the short-term estimators and presenting an error correction model corresponding to the established cointegration or the long-term equilibriums. The notion CointEq (−1) defines the delayed residue originating from our long-term equilibrium equation. The negative sign of its estimated coefficient and its significance for both countries thus confirm the presence of an error correction tool. The coefficient of the cointegration equation explains the order in which the variable CO2 will be mobilized towards the long-term target.

Findings presented in **Table 4** confirm that ECT is negative and significant which proves that there is a cointegration relationship between the variables of the model. In fact, a negative sign of ECT is essential for a stable error correction mechanism.

With regard to the GDP variable, the short-run results presented in **Table 4** demonstrate that the coefficient of the present value of the GDP is significant and positive in both Tunisia and Morocco. That is means that economic growth was found to have increased the quantity of CO2 emissions in the case of Tunisia and Morocco. The positive impact of GDP on CO2 emissions can be explained, essentially, by the fact that when economic growth improves, the use of energy increases. So the increase in CO2 emissions is mainly due to the combustion of petroleum, coal, and natural gas for energy purposes. Also, the environmental

		ADF		GLS		PP		KPSS	
		Level	First difference	Level	First difference	Level	First difference	Level	First difference
Morocco	**CO2**	0.094	−6.834*	−2.276	−5.942***	−2.678	−6.865***	0.177**	0.053
	Fbs	−3.536*	−3.606**	−3.644**	−3.667***	−1.611	−31.772*	0.698**	0.127
	Find	−1.403	−3.405**	−1.584	−3.503**	−1.811	−3.459*	0.395***	0.262
	Fts	−3.831**	−3.040**	−3.120*	−3.127*	−1.943	−3.032***	0.119*	0.149
	GDP	−12.406***	−12.284***	−12.707***	−8.862***	−11.629***	−32.107***	0.698*	0.052
	Inf	−4.231**	−4.669***	−1.043	−4.799***	−1.365	−4.652**	0.191**	0.191
	internet	0.276	−4.548***	−1.043	−4.780**	−2.143	−4.569***	0.948***	0.185
	Inv	−2.686	−6.470***	−2.597**	−6.269***	−2.686	−8.123***	1.132***	0.037
	Mcs	−3.927**	−2.686**	−2.486	−2.483*	0.785	−1.903***	1.164***	0.038
	trade	−2.186	−11.489***	−2.323	−6.614*	−2.186	−11.489***	0.404***	0.060
Tunisia	**CO2**	−6.834***	−6.770***	−2.276	−6.832***	−2.678	−6.865***	0.224***	0.150
	Fbs	−3.536**	−3.606**	−3.644**	−5.079***	−1.611	−3.540**	1.165***	0.071
	Find	−1.403	−3.405***	−1.584	−3.503**	−1.811	−3.459**	0.162**	0.149
	Fts	−1.826	−3.040***	−3.120*	−3.127*	−1.943	−3.035**	0.121**	0.204
	GDP	−12.406***	−12.284***	−12.707***	−8.862***	−11.629***	−32.107***	0.422***	0.034
	Inf	−1.349	−4.669***	−1.043	−4.799***	−1.365	−4.652***	0.240***	0.053
	internet	−2.109	−4.545***	−1.044	−4.780***	−2.143	−4.569**	0.144*	0.196
	Inv	−2.686	−6.470***	−2.597	−6.269***	−2.686	−8.123***	0.246***	0.053
	Mcs	−2.071	−3.927**	−2.486	−2.483**	−1.444	−1.903**	0.144*	0.149
	trade	−2.265	−7.637***	−2.323	−6.614***	−2.186	−11.489***	1.132*	0.039

, **, and * denote significant at 10%, 5%, and 1% levels, respectively.*

Table 1.
Unit root test results.

		fbs		Fts		Internet		mcs		GDP	
		Value	**k**	**Value**	**K**	**Value**	**k**	**Value**	**k**	**Value**	**k**
Morocco	F-statistic	13.34639	5	7.957230	5	5.9031****	5	487.8914****	5	3.358989	5
TUnisia	F-statistic	234.7109	5	3.554646	5	20.24249	5	8.660912	5	8.524899	5
						Critical Value Bounds					
	Significance	I0 Bound	I1 Bound	I0 Bound	I1 Bound	I0 Bound	I1 Bound	I0 Bound	I1 Bound	I0 Bound	I1 Bound
	10%	2.26	3.35	2.26	3.35	2.26	3.35	2.26	3.35	2.26	3.35
	5%	2.62	3.79	2.62	3.79	2.62	3.79	2.62	3.79	2.62	3.79
	2.5%	2.96	4.18	2.96	4.18	2.96	4.18	2.96	4.18	2.96	4.18
	1%	3.41	4.68	3.41	4.68	3.41	4.68	3.41	4.68	3.41	4.68

*Note. **** indicate the significance level at 5%.*

Table 2.
Bounds test results.

	Tunisia					Morocco				
D(fts)	**0.105667**					**0.011213**				
	(0.0919)*					(0.0475)**				
D(internet)		0.004530					0.005531			
		(0.0042)***					(0.0485)**			
D(fbs)			0.158974					0.001738		
			(0.0472)**					(0.0569)*		
D(mcs)				0.002628					0.184381	
				(0.0316)**					(0.4265)	
D(GDP)					0.000684*					0.003092
					(0.09496)					(0.0445)**
D(find)	0.002388	−0.002113	−0.011840	0.000783	−0.001869	−0.000413	−0.002521	−0.001001	0.006334	−0.000329
	(0.5233)	(0.2962)	(0.3223)	(0.8444)	(0.7603)	(0.6553)	(0.1600)	(0.4777)	(0.2285)	(0.6871)
D(inf)	−0.002588	0.001626	−0.000621	0.003166	−0.004688	0.004286	0.012687	0.007773	−0.027115	0.007647
	(0.1844)	(0.2852)	(0.8153)	(0.0634)*	(0.0001)***	(0.0141)**	(0.0038)***	(0.0018)***	(0.5197)	(0.0030)***
D(invst)	0.003481	0.020667	−0.053407	0.008117	0.009292	−0.003520	0.000205	0.003657	0.029790	−0.001589
	(0.5665)	(0.0071)***	(0.1752)	(0.2229)	(0.3172)	(0.2429)	(0.9772)	(0.4782)	(0.3270)	(0.6529)
D(trade)	−0.000375	−0.002699	0.008266	−0.000626	0.000796	0.006081	0.008216	0.003704	−0.002034	0.007584
	(0.8776)	(0.1187)	(0.0756)*	(0.8237)	(0.6337)	(0.0186)**	(0.0162)**	(0.1651)	(0.8645)	(0.0006)***
ECT	−0.497580	−0.160037	−2.047010	−0.535696	−0.138107	−0.493236	−1.103459	−0.994354	−0.746526	−0.584643
	(0.0431)**	(0.0087)***	(0.0177)**	(0.0313)**	(0.0993)*	(0.0190)**	(0.0007)***	(0.0325)**	(0.0018)***	(0.0220)**

*Note. P value in parenthesis ***,** and * indicate the significance level at 1% , 5% and 10% respectively.*

Table 3.
Short-run estimation and cointegration form.

	Tunisia					Morocco				
FTS	**0.014691**					**0.022735**				
	(0.0526)*					(0.0396)**				
INTERNET		0.028306					0.005012			
		(0.0208)**					(0.0110)**			
FBS			0.077662					0.002329		
			(0.0051)***					(0.0123)**		
MCS				0.004905					0.185428	
				(0.0014)***					(0.4076)	
GDP					0.149964**					0.005288**
					(0.04622)					(0.01357)
FIND	0.004799	−0.013206	−0.005784	0.001462	0.027690	−0.000837	−0.002285	−0.001342	0.006370	−0.000563
	(0.4287)	(0.4708)	(0.3024)	(0.8368)	(0.3448)	(0.6819)	(0.1332)	(0.4746)	(0.2397)	(0.7142)
INF	−0.008440	−0.010158	−0.000304	−0.005910	−0.005682	−0.008689	−0.011498	−0.010412	−0.027269	−0.013080
	(0.1041)	(0.2053)	(0.8181)	(0.0016)***	(0.1710)	(0.0000)***	(0.0000)***	(0.0000)***	(0.5299)	(0.0000)***
INVST	0.006996	0.129142	−0.026090	−0.015153	−0.048841	−0.007136	−0.000186	−0.004898	−0.029959	−0.026250
	(0.0752)*	(0.0201)**	(0.0787)*	(0.0968)*	(0.0493)**	(0.0073)***	(0.0772)*	(0.0414)**	(0.0157)**	(0.0497)**
TRADE	0.000754	0.016865	0.004038	0.001169	0.006493	0.012330	0.007445	0.004961	0.002045	0.002851
	(0.8782)	(0.2270)	(0.0415)**	(0.8218)	(0.5486)	(0.0077)***	(0.0152)**	(0.1786)	(0.8627)	(0.5455)
C	0.768715		2.799803	0.936388	0.152608		−0.071089		2.715745	−0.698423
	(0.1669)		(0.0047)***	(0.1395)	(0.9250)		(0.7147)		(0.4284)	(0.0127)**

*Note. P value in parenthesis ***,** and * indicate the significance level at 1% , 5% and 10% respectively.*

Table 4.
Long runform.

quality can be deteriorated by certain industrial processes namely the production of cement, the manufacture of clothing, the alcohol factories, etc. Then, the increase in the number of economic activities has a detrimental effect on the environmental quality.

It is not surprising that there is a strong negative relationship between ICT diffusion and environmental quality, in the short-run model. In fact, the coefficients of each measure of ICT (fbs, fts, internet, and mcs) are significant and positive, implying that fts, fbs, internet, and mcs negatively influence the Moroccan and Tunisian environmental quality. It means that the ICT diffusion increases the CO2 emissions. Concerning the variable find, we note that both present and first delayed value have positive effects on carbon emissions of the two countries.

Besides, the findings presented in **Table 4** confirm that in the short run, the openness deteriorates the Moroccan and Tunisian environmental quality. In fact, the coefficient of the variable open is positive and significant in all models.

As apparent in **Table 4**, the coefficient of the variable inf is negative and significant in all models in short run. Therefore, inflation ameliorates the environmental quality in both countries. This negative relationship between carbon emissions and inf can be explained by the fact that when prices increases, energy consumption decreases; as a result the CO2 emissions decrease. Also, we can see that the first delayed value of inf affect negatively the Tunisian CO2 emissions in the first model when we introduce the variable fts as a measure of ICT.

Finally, the variable invst has not an impact on environmental quality in both countries. In fact the coefficient of this variable is insignificant, except, in the case of Tunisia, when we introduce the variable internet in our model invst affects positively and significantly the CO2 emissions. That is means that invst deteriorates the Tunisian environmental quality. The positive relationship between CO2 emissions and invst can be explained, especially, by the fact that invst increases energy consumption that deteriorates the environmental quality.

We can deduce from **Table 3** that there is substantial evidence that the variables ICT and GDP have long-run effects on CO2 emissions. Therefore, we will examine the long-run direct impact of ICT and GDP on CO2 emissions for both countries. So, we will find for each country five regressions.

Findings presented in **Table 4** confirm that in the long term all explanatory variables have the same signs of the coefficients in both countries. Similarly the GDP and ICT conserve the same sign in the short run. In other words, in the long run, the economic growth and the ICT diffusion deteriorate the environmental quality in both countries. In fact the coefficient of the variables fbs, fts, internet, mcs, and GDP are positive and significant, so when ICT and GDP increase, the CO2 emissions increase.

5.2 The effect of the interaction between ICT and GDP on environmental quality

To examine the role of the interaction between ICT diffusion and economic growth on enhancing the environmental quality, we will estimate in this section Eq. (3) where we will introduce in our model the variable (GDP*ICT). Because the ICT is measured by four measures (fbs, fts, internet and mcs), we will find for each country four regressions.

The ARDL bounds test results are presented in **Table 5** which demonstrates that the calculated F-statistics value is greater than the upper bounds value at 10% and 5% level of significance that indicates that cointegration exists among the study variables, both in Tunisia and Morocco for all our models.

		fbs		fts		Internet		mcs		GDP	
		Value	**k**	**Value**	**k**	**Value**	**K**	**Value**	**k**	**Value**	**k**
Morocco	F-statistic	12.71726	7	6.405506	7	3.371104	7	2.734757	7	12.71726	7
Tunisia	F-statistic	12.97897	7	3.516422	7	28.00420	7	12.82016	7	12.97897	7
						Critical Value Bounds					
	Significance	I0 Bound	I1 Bound	I0 Bound	I1 Bound	I0 Bound	I1 Bound	I0 Bound	I1 Bound	I0 Bound	I1 Bound
	10%	1.7	2.83	1.7	2.83	1.7	2.83	1.7	2.83	1.7	2.83
	5%	1.97	3.18	1.97	3.18	1.97	3.18	1.97	3.18	1.97	3.18
	2.5%	2.22	3.49	2.22	3.49	2.22	3.49	2.22	3.49	2.22	3.49
	1%	2.54	3.91	2.54	3.91	2.54	3.91	2.54	3.91	2.54	3.91

Table 5.
Bounds test results.

	Tunisia				Morocco			
D(FTS)	**0.007626**				**0.009802**			
	(0.0362)**				(0.0405)**			
D(INTERNET)		−0.000788				0.006990		
		(0.0228)**				(0.0427)**		
D(FBS)			0.000959				0.001933	
			(0.0407)**				(0.0909)*	
D(MCS)				0.042950				0.139341
				(0.0125)**				(0.0123)**
D(GDP)	−0.025938	0.016386	−0.015631	−0.094974	−0.000578	0.002642	0.000161	−0.017687
	(0.0565)*	(0.0710)*	(0.0802)*	(0.0828)*	(0.0490)**	(0.0058)***	(0.0824)*	(0.0142)**
D(GDPFTS)	−0.004384				−0.002708			
	(0.0180)**				(0.0923)*			
D(GDPINTERNET)		−0.001025				−0.000331		
		(0.0190)**				(0.0154)**		
D(GDPFBS)			−0.000365				−0.000075	
			(0.0335)**				(0.0552)*	
D(GDPMCS)				−0.025092				−0.007739
				(0.0337)**				(0.0075)***
D(FIND)	0.000552	−0.005342	0.000915	−0.018410	−0.000519	−0.002094	−0.001061	0.005571
	(0.0795)*	(0.0052)***	(0.0782)*	(0.0791)*	(0.0462)**	(0.0878)*	(0.0207)**	(0.0093)***
D(INF)	−0.001820	−0.003863	0.002051	0.001095	0.004997	0.003863	0.007665	−0.021106
	(0.2421)	(0.0513)*	(0.1896)	(0.8309)	(0.0164)**	(0.6818)	(0.0022)***	(0.4839)
D(INVST)	0.008630	0.026646	0.009787	0.017724	0.000159	0.005296	0.003870	0.028430

	Tunisia				Morocco			
D(FTS)	**0.007626**				**0.009802**			
	(0.1660)	(0.0497)**	(0.0986)*	(0.6759)	(0.9840)	(0.5974)	(0.3379)	(0.2448)
D(TRADE)	0.003438	−0.003735	−0.001877	0.005669	0.005581	0.008942	0.003731	−0.001604
	(0.0855)*	(0.0614)*	(0.4222)	(0.4899)	(0.1024)	(0.0255)**	(0.0524)*	(0.8712)
ECT	−0.174438	−0.279499	−0.377606	−6.957784	−0.504973	−0.958871	−0.724671	−1.061297
	(0.0986)*	(0.0581)*	(0.0832)*	(0.0770)*	(0.0098)***	(0.0111)**	(0.0045)***	(0.0646)*

*Note. P value in parenthesis ***,** and * indicate the significance level at 1% , 5% and 10% respectively.*

Table 6.
Short-run estimation and cointegration form.

	Tunisia				Morocco			
FTS	**0.043715**				**0.019411**			
	(0.0231)**				(0.4638)			
INTERNET		0.002819				0.007290		
		(0.0996)*				(0.0428)**		
FBS			0.002540				0.002667	
			(0.0674)*				(0.0849)*	
MCS				0.006173				0.131293
				(0.0581)**				(0.0819)*
GDP	−0.148696	−0.058628	−0.041395	−0.013650	−0.001144	0.002755	0.000223	−0.016666
	(0.0205)**	(0.1760)	(0.2187)	(0.0031)***	(0.7554)	(0.5310)	(0.0826)*	(0.0408)**
GDPFTS	−0.025132				−0.005362			
	(0.0921)*				(0.0017)***			
GDPINTERNET		−0.003666				−0.000345		
		(0.0026)***				(0.0601)*		
GDPFBS			−0.000965				−0.000103	
			(0.0415)**				(0.0653)*	
GDPMCS				−0.003606				−0.007292
				(0.0044)***				(0.7065)
FIND	0.003163	0.019114	0.002424	−0.002646	−0.001027	−0.002184	−0.001464	0.005249
	(0.8657)	(0.5073)	(0.7643)	(0.1101)	(0.7575)	(0.2443)	(0.4920)	(0.1721)
INF	−0.010435	0.013821	0.005431	0.000157	0.009895	0.004029	0.010577	−0.019887
	(0.4436)	(0.2102)	(0.0148)**	(0.8065)	(0.0005)***	(0.6556	(0.0000)***	(0.4713)

	Tunisia				Morocco			
FTS	**0.043715**				**0.019411**			
INVST	0.049474	−0.095336	0.025918	0.002547	0.000315	0.005524	0.005340	0.026788
	(0.4570)	(0.0865)*	(0.2200)	(0.7252)	(0.9840)	(0.6202)	(0.3290)	(0.1955)
TRADE	0.019707	0.013364	−0.004972	0.000815	0.011052	0.009326	0.005148	−0.001512
	(0.0279)**	(0.0799)*	(0.0471)**	(0.0943)*	(0.0110)**	(0.0412)**	(0.0618)*	(0.0660)*
C	−0.535858	0.666908	1.168986	1.268434	−0.222434	0.289130	−0.028577	2.248929
	(0.0915)*	(0.0268)**	(0.0201)**	(0.0104)**	(0.0683)*	(0.0765)*	(0.0197)**	(0.3187)

*Note. P value in parenthesis ***,** and * indicate the significance level at 1% , 5% and 10% respectively.*

Table 7.
Long-run estimation.

	Tunisia	Morocco
FTS does not Granger cause CO2	7.878**	17.916*
CO2 does not Granger cause FTS	2.324	0.940
FBS does not Granger cause CO2	6.830**	8.764*
CO2 does not Granger cause FBS	1.858	1.255
MCS does not Granger cause CO2	5.666***	8.734**
CO2 does not Granger cause MCS	3.880	0.596
INTERNET does not Granger cause CO2	21.896*	5.075***
CO2 does not Granger cause INTERNET	1.940	0.831
FTS does not Granger cause CO2	10.590*	16.204***
CO2 does not Granger cause FTS	3.642	0.142
FTS does not Granger cause CO2	12.128*	6.412*
CO2 does not Granger cause FTS	2.782	2.422
GDP does not Granger cause CO2	23.171***	15.753***
CO2 does not Granger cause GDP	8.734**	8.764*

*Note. P value in parenthesis ***,** and * indicate the significance level at 1% , 5% and 10% respectively.*

Table 8.
Toda and Yamamoto granger causality test results.

Findings presented in **Table 6** resume the ARDL short-run relationship between the dependent variable and the explanatory variables. It is necessary to note that the sign of ECTt-1 is as we expected. It is negative and statistically significant. Then, we can conclude that there is a cointegration relationship between the variables of the model.

Findings presented in **Table 7** show that in the short run, the coefficient of the variable of the interaction between ICT and economic growth is positive and significant. The positive relationship running from the interaction between ICT and economic growth toward carbon emissions signifies that economic growth is a channel through which ICT enhances the environmental quality in both countries. The result collaborates with the findings of Khan et al. [9] and Danish et al. [14]. So, we can conclude that in the short term, the Moroccan and Tunisian economic growths were found to be a channel through ICT to improve the environmental quality.

Similarly, in the long run, the impact of the interaction between economic growth and technology on CO2 emissions was found to be positive and significant in all models where ICT is measured by fbs, fts, internet, and mcs. These results confirm that, also, in the long term, economic growth increased ICT's ability to improve the environmental quality in both countries.

5.3 Toda and Yamamoto granger causality test results

The next step is to examine the directions and causality between the variables for the cross-check of our findings using the Toda and Yamamoto Granger causality test. The results of this test are presented in **Table 8**. Based on the objective of this paper, we are going to be concerned about the results of the relationship between GDP, CO2 emission, and ICT. As we could see from **Table 8**, there is bidirectional causality between CO2 emissions and economic growth; however, there is a uni-directional causality running from each measure of ICT (FTS, FBS, MCS, and INTERNET) to CO2 without feedback.

6. Conclusion

Environmental quality is mainly affected by the use of ICT for economic growth. The objective of this study is to examine the relationship between ICT diffusion, economic growth, and environmental quality in Morocco and Tunisia from 1980 to 2018. An ARDL simulation model was utilized to describe the short-term and the long-term impact of ICT and economic growth on environmental quality in both countries. Findings of ARDL simulations model indicate that, in the short and long term, ICT and economic growth boost Moroccan and Tunisian CO2 emissions. However, the interaction between ICT and economic growth mitigates this effect. In other word, the interaction between ICT and economic growth enhances the environmental quality in both countries. Our results collaborate those of Khan et al. [9] and Danish et al. [14] which indicate a negative relationship running from the interaction between the ICT diffusion and economic growth to CO2 emissions.

It is recommended that policy makers in Morocco and Tunisia should adopt such policies that help to reduce CO2 emissions by enhancing the use of ICT for economic growth. In fact, the policy makers should adopt modern technology for electrical products and industrial production. Also, policy makers should develop policies that center on energy efficient infrastructure and use clean energy. Similarly, the policy makers should design policies to control the inefficient use of ICTs and originate green ICT projects.

Future papers for investigating the role of ICT in moderating the effect of GDP on CO2 emissions can focus on other large samples, such as MENA countries. Also, future studies may focus on a comparative analysis of the relationship between ICT, GDP, and CO2 emissions in developing and developed countries.

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Chapter 4

Belarus-China: Avoiding the "Debt Trap"

Kiryl Rudy

Abstract

Since 2005 Belarus with its developing Post-Soviet economy has been attracting loans from China. By 2019 China became among top three international lenders for Belarus. On one hand Chinese loans financed infrastructure and industrial projects and supported economic growth in Belarus, and on the other hand they increased import from China and foreign debt of Belarus. In order to overcome the phobia of Chinese "debt trap" the Government of Belarus recently decreased the number and amount of Chinese loans tied to infrastructure projects, improved credit terms, increased FDI from China, and created joint industrial park 'Great Stone'. As a result, the case of Belarus and China outlines how to avoid "debt trap" in 'Belt and Road' initiative by focusing on FDI from China.

Keywords: government debt, foreign direct investments, "debt trap", 'Belt and Road' initiative

1. Introduction

There is a polar attitude to the raising activity of China with its 'Belt and Road' initiative in providing lending to developing countries.

On the one hand, the raise of China increased concern in Western political and academic circles [1–3]. It also reveals the Trump's Administration phobia of China global expansion using the so called "debt trap" diplomacy. The logic of the "debt trap" fear is as follows: China provides a loan tied to the implementation of a foreign project by Chinese companies, usually under the guarantee of the Government of the borrowing country. After the launch, the project becomes economically inefficient, does not accumulate the cash flow necessary to repay the loan, and the Government begins to repay the loan from the budget. This sometimes becomes the topic for discussion in the local media, blaming not the borrower with its insufficient business plan and misusing the funds, but accusing China of driving the country into a "debt trap". International media catch up these cases to show the global trend of China's rising role in lending the emerging markets and increasing the world debt. Recent studies prove that the scale of the problem is underrated, as 50% China's overseas lending to developing countries is not reported to international organizations and therefore has hidden impact on global debt [4].

On the other hand, some experts on China argue that this "debt trap" is a myth [5]. Here it can be called phobia as since so far, there has not been a single case when a country has defaulted on Chinese loans. Nevertheless, there are a number of practical examples of the debt management with Chinese lending, which are useful to consider. China's debt financed growth strategy after Global financial crises in 2008

with vivid economic results became role model for developing countries financial strategies of nation building [6].

The truth is in the middle. China is exporting its financial model of growth to developing countries not always taking into account the different political systems, public attitude to the foreign debt, and domestic authority competence which finally leads to accusing the lender (earlier international financial organizations, IMF, now China) in debt problems of some developing countries. The case of China's "debt trap" includes several parts like the choice of the project, contractor, and lender. This time it's not the issue of high interest rates which traditionally is the cause of "debt trap" in some countries like India and the Philippines [7]. Chinese lending terms including interest rates are competitive and in some cases lower than the market.

Belarus is indicative case of debt cooperation with China. This Post-Soviet country with long-term transition to democracy and market economy is trapped in state capitalism [8]. Due to Soviet heritage of the country, personal friendly attitude of the Belarus' President to China, the country has close strategic political connections with China, and it provides good environment to attract China's funds to support Belarus' economic growth. Nevertheless, facing challenges with some investment projects financed by Chinese loans, Belarus started not only voluntary debt reduction but also transition from Chinese debt to Chinese direct Investments. China-Belarus industrial park 'Great Stone' plays important role in such transition and avoiding the "debt trap".

This chapter includes several parts. The next one provides overview of China's "debt trap" demonstration cases in Sri Lanka, Pakistan, and Ecuador. Based on that, three parts of Chinese "debt trap" were analyzed. Another one describes the case of Belarus and its channels to avoid Chinese "debt trap". The last one reveals the development and role of Sino-Belarus industrial park 'Great Stone' in avoiding the "debt trap".

2. Chinese "debt trap": the cases of Sri Lanka, Pakistan, Ecuador, and parts of its mechanism

A China expert Tom Miller, in his book *The Chinese Asian Dream*, explains the distribution of Chinese growth model in Asia and also mentions some examples of the countries that have fallen into so called Chinese "debt trap" including some from Central and Southeast Asia [9]. His story can be expanded beyond 'Belt and Road' initiative as it reminds of the history of China's work in Africa from 2006 to 2010, when, in 2007, Beijing was forced to write off foreign debt to 33 African countries, due to their insolvency - totaling $1.5bn [10]. Among rich international experience of debt cooperation with China three cases can become the description of its political economic interconnections: Sri Lanka, Pakistan, and Ecuador.

2.1 Demonstration cases of Chinese "debt trap"

2.1.1 Sri Lanka

This case was among the hottest example of Chinese "debt trap" in international media in 2010s. Between 2010 and 2015, 70% of infrastructure projects in this country were built and funded by China. China built an airport, expressways, power plants, a cricket stadium, conference centers, office buildings, residential areas and more. There were cases reported in international media when, during the construction process, Chinese contractors increased the cost of the project by

40–60% of the original, which was sometimes associated with changes that the customer made to the project. In addition, claims arose regarding compliance by Chinese contractors with construction and other national standards. To finance the construction of these facilities, Chinese commercial banks provided loans at a market rate of about 6%, sometimes it reached 8.8%. When the government changed in Sri Lanka in 2015, all these issues began to be discussed publicly. In early 2015, the country's finance minister said that to resolve debt problems with China, an agreement was reached with a Chinese bank on a large new loan at 2%, for refinancing an old loan at 6.9% [9]. Among the most publicly discussed projects were the airport and seaport. The project to build an international airport in the city of Mattala caused a public outcry when Beijing refused to take it for itself instead of paying off the loan issued for its construction [11]. According to the seaport project in the city of Hambantota, the Government of Sri Lanka, following negotiations related to difficulties in servicing the Chinese loan received for construction, announced to give the port to China for 99 years [12]. But by now Sri Lanka still keep this project under its control.

To conclude one needs to look away from popular media narratives and see the broader picture. As of 2019 China holds only 10 percent of Sri Lanka's foreign debt, Japan and the World Bank hold 11 percent each, the Asian Development Bank – 14 percent, private sector – 39 percent. As Sri Lanka did not defaulted on China's debt, this case seems to be publicly overheated.

2.1.2 Pakistan

It is difficult to imagine a more favorable and 'all-weather' political relationship with China than that of Pakistan. The China-Pakistan economic corridor was positioned as a model project of the 'Belt and Road' initiative. For this purpose, investments of $46bn were announced — comparable to 17% of Pakistan's GDP in 2015 [1]. Previously, a major Chinese project in Pakistan was the Gwadar port, which was under construction since 2000, having been leased to China in 2013. It seemed that the excellent political relations between Pakistan and China would create appropriate conditions for the implementation of joint economic projects. However, in July 2017, Pakistan's Prime Minister, Nawaz Sharif, was removed from power. In early 2018, Pakistan publicly rejected a $14bn project with China to build a hydroelectric complex, due to unfavorable contract and loan terms offered by the Chinese. In September 2018, the media reported that the new government of Pakistan was discussing the possibility of reviewing the terms of construction of the China-Pakistan corridor. Debt relief was put on the bilateral agenda, but it did not stop Pakistan from attracting new loans from China. The Belt and Road initiative had found new life in Pakistan in 2020 with the signing of $11 bln worth of projects.

Looks like the countries passed the phases of short-term debt challenges, overcame COVID-19 consequences and opened new chapter in bilateral investment cooperation.

2.1.3 Ecuador

On December 12, 2018, the President of Ecuador, Lenin Moreno, visited Beijing and met with Chinese Chairman Xi Jinping. A week before, Mr. Moreno announced that the goal of his talks in China was to reduce the $6.5bn debt burden owed by the government of Ecuador. However, the projects built at the expense of Chinese loans (HPP, roads, bridges and hospitals) had not accumulated the necessary money to repay debts. For example, a large hydroelectric power plant built near an active volcano was operating at half capacity, and a loan from Export–Import Bank of

China for $1.7bn (for 15 years at 7%) required maintenance of $125 m per year [13]. At the same time, the government of Ecuador faced a drop in export revenue due to lower prices for oil - its main export product, so the country's authorities also had difficulties in repaying the loan [14]. The meeting between Moreno and Xi resulted to a new loan of $900 m to refinance the part of existing one. In September 2020 Ecuador has reached another deal with Chinese Eximbank to delay a $474 m loan payment due 2020 and 2021 until 2022. This case shows that even if Chinese "debt trap" exists it has its ways out.

These three cases raise the question: why some developing countries choose to attract Chinese loans and get into so called Chinese "debt trap". To answer this question, several parts of "debt trap" mechanism should be analyzed sequentially.

2.2 Parts of the "debt trap"

2.2.1 Project choice

The "debt trap" is related to project lending, so the project itself (for example, the construction of a power plant, a road, or a factory) is of primary importance, rather than being the source of its financing. China does not initially offer a loan, but participates in a tender for the construction of a project, together with a loan. The main question is who chooses the project, and how. In practice, it's the customer who proceeds from a business plan and feasibility study. The choice of an infrastructure project is often made at the request of authorities, compared with other countries, and very often is not based on an assessment of the potential demand for the object. The expectation that planes and ships fail to come to Sri Lanka just because there is no airport or seaport there is wrong. Other conditions are also important, such as security, service, price, and the so called friendly business environment. Therefore, the problem of choosing a project by the state is not only a matter of business planning and preliminary assessment, but also the overall quality of economic policy and the competence of the state apparatus.

Developed countries are less prone to the "debt trap", not because they have their own funding for projects, but because they have different decision-making procedures, checks and balances, and political responsibility. Before accusing China of undertaking projects that are ineffective, it is important to answer two questions. The first is whether there are still problematic projects in the country that were implemented by non-Chinese companies. The second is, are there any successful projects that Chinese companies have implemented in the country? If both questions are answered in the affirmative, then it should be concluded that the problem is rooted not in China, but in the customer or in the project itself.

2.2.2 Contractor choice

Accusations that the services of Chinese contractors are expensive and do not meet standards should take into account that the choice of a contractor is usually based on an international tender. An exception is the case when China provides a preferential loan, then the tender is held among Chinese companies identified by the Ministry of Commerce of the PRC. However, the main question is why a Chinese contractor wins an international tender. Does this happen because of price, technology, brand, stated deadlines, or corruption? Chinese contractors sometimes mention that "it is impossible to get a Lexus car for the price of an Opel car". However, this is often what the customer from developing country expects. Therefore, low price and high speed are often accompanied by cheaper prices, due to the Chinese contractor ignoring national norms. Forcing a Chinese contractor to comply with

national standards during the construction of a project sometimes leads to a higher cost. It is also important to take into account that the cost of the commercial offers by Chinese companies was lower than of their competitors during tenders, but was growing annually. For example, from 2005 to 2008, Chinese offers were 40–50% cheaper than those of competitors but, from 2009 to 2011, the figure dropped to 30%. Later, they were cheaper by only 5–10%, if available.

It is also important to note that choosing a contractor is a negotiation process, and the Chinese are skilled and experienced negotiators. They understand not only the technical details of the project, attracting the best engineers, and preparing contracts attracting professional international lawyers, but also the cultural issues and psychology of partners, primarily looking at the decision-making levels, subordination, and weaknesses of the other side. As a result, when choosing a contractor, Chinese companies beat not only their competitors, but also the customer. It's only possible to counter this with professionalism, which developing countries clearly lack.

2.2.3 Lender choice

Tied export lending is an international practice and is usually offered by each bidder. In the Chinese case, the tied loan is long-term, up to 15 years, and usually covers 85–95% of the commercial contract, while 30–50% of the contract must be related to the work of Chinese builders and suppliers. All these provide three advantages.

Firstly, the borrower does not need to divert significant amounts of their own funds in the current period to implement the project: but only in the future — in around five years — to repay the loan within a usual 10-year period.

Secondly, as this loan covers 85–95% of the cost of projects, so the customer only needs to find the missing amount for advance payment. The targeted nature of tied loans implies that they cannot be used in the financial market, for example, to manage the exchange rate. Therefore, the risks of tied loans are limited primarily by the microeconomics of the project, and then by the country's macroeconomics. At the same time, the Government guarantee provided for a tied loan sometimes reassured the lender, who was less concerned about the project and more about the state's solvency.

Thirdly, as 30–50% of the cost of a commercial contract would be covered by Chinese companies, the remaining currency, up to 50–70% of the contract value, was spent on the purchase, the main equipment of a Western brand, and payment to domestic designers and builders. If a Chinese tied loan is preferential (at the rate of 2–3%), then the Chinese share must exceed 50% of the contract (60% from 2019). If it is commercial (at a market rate and linked to the LIBOR, with insurance), then the share must be at least 30%.

The cost of commercial Chinese credit provided by such banks as Export–Import Bank of China, China Development Bank, ICBC, China CITIC Bank, and others depends on the country's internal rating and funding opportunities of the banks themselves, and ranges from 5–9%. This should be supplemented by an insurance of the China Export and Credit Insurance Corporation, Sinosure, with a premium of 6–9% — which is less than the insurance of Western insurance companies for developing countries with a premium of 8–12%. In the case of preferential Chinese loans provided by the Chinese Government through Eximbank of China, insurance is not required, while the interest rate ranges from 1–3%. In general, the final rates of Chinese loans are competitive, and, given cheaper insurance, the borrower is inclined to choose financing from China. To avoid the "debt trap" concern, customers can use their own resources to finance a project: i.e. attracted untied

loans from the international market (for developing countries, the rate — depending on the rating — ranges from 4–7%, which is comparable to Chinese commercial loans) or borrowed from international financial institutions (the rates of the IMF, and the World Bank can be 1%–2.5% which is comparable with the rates of concessional loans by the Chinese Government). Overall, the choice of a lender, as well as the choice of a project and a contractor, is the right of customers and depends on their competence.

Accordingly, the "debt trap" is a concern for weak borrowers who are not able to stop building up their debt in time, or are not ready to show skill in managing it. All these problems of the developing country's government — as a customer of the project and a borrower — are actively used by the opposition in the political struggle. The latter tries to solve problems of external public debt, not by changing internal procedures and economic policies, but by accusing the current government first, and then, when it comes to power, external forces - in this case China, as a major creditor.

3. Belarus-China: the channels to avoid the "debt trap"

The first Chinese tied loans came to Belarus in 2005. It all started with the establishment of the BeST mobile operator; later, the reconstruction of Minsk TPP-2, Minsk TPP-5, the construction of three cement plants, the installation of steam-gas units at Bereza, and Lukoml regional electric power plants, the reconstruction of a section of the M5 highway, the electrification of the railways, the purchase of locomotives, and the launch of a national satellite, and others followed. The list can be continued: all data was regularly collected (often administratively) by the Government of Belarus from subordinate organizations and sent to the Chinese. As a result, the sample of tied Chinese loans provided to the Belarusian government, or under its guarantee, increased from $35.3 m in 2005 to $543.1 m in 2009.

From 2010 to 2012, the tied lending cooperation became better structured, due to the opening of the first large-scale credit lines by China to Belarus. In December 2009, Eximbank of China provided a commercial credit line of $5.7bn to the Belarusian Government and, in March 2010, the China Development Bank launched an $8.3bn commercial credit line. In June 2010, the Chinese Government approved a $1bn preferential credit line, and, in September 2011, another $1bn preferential credit line followed. The terms of the two Chinese banks' commercial credit lines were market-based: a 6-month LIBOR interest rate of +3–4.5%, management fees and liabilities of 0.3–0.7%, an 8–15 loan term with a preferential period of 3–5 years, and a Sinosure insurance premium of 6–7%. Those credit lines were, in fact, quite competitive in the international financial market: in terms of rate, terms, and insurance. To compare, we'll recall July 26, 2010 when Belarus issued $600 m of its debut Eurobonds at 8.75% with a maturity date of August 3, 2015. At that time, Chinese tied loans were cheaper, and were provided for a longer term. In addition, an important advantage of Chinese loans was that Sinosure insurance was half as cheap as that of Western insurers: i.e. German Hermes offered it at a rate of 10–12% for Belarus. The terms of the two open preferential credit lines from China were more attractive: the interest rate of the former made 3%, of the latter — 2%, with loan terms of 15 years and a preferential period of 5 years, without insurance. All preferential, and some of the commercial, loans were taken from those credit lines. The number of projects financed by tied Chinese loans increased in Belarus from 1 in 2007 to 5 in 2011. Accordingly, the amount of tied loans began to grow. In 2011, the sample size made $417.9 m, in 2012 — $488.5 m, in 2013 — $1.1bn, and in 2014 — $699 m.

In May 2015, Chinese Chairman Xi Jinping paid a state visit to Belarus, giving new impetus to the credit cooperation between the two countries. As part of his visit, Xi Jinping announced the opening of two more credit lines to Belarus: $4bn commercial and $3bn preferential. The preparation for that visit, and the administrative provisioning of the open credit lines, resulted in the situation that, in 2015, the number of credit agreements between Belarus and China reached 9: the maximum signed between the countries per year.

In the new era, Belarus had to repay previously raised tied Chinese loans. Problems with cement sales resulted in the inability of the Belarusian cement plants, modernized at the expense of Chinese loans, to repay their loans independently; their obligations were assumed by the Belarusian Government. The Dobrush Paper Mill also faced problems with a Chinese loan, and the Government provided support for debt repayment. As a result, the debt guaranteed by the Belarusian state to China was growing, and it was necessary to repay it from the Belarusian budget. In this regard, Belarusian state agencies began discussing the need to move away from the path leading the country into a "debt trap", and also to improve the project financing model. Those discussions were fueled by the concern that tied Chinese loans were leading to an increase in Chinese imports. Accordingly, the Belarusian experience of avoiding this "debt trap" developed through several channels:

1. moving away from tied loans as part of state debt management;

2. moving away from tied loans as part of import reduction;

3. transition from tied loans to untargeted credits; and

4. transition from credit cooperation to direct investment liaisons.

3.1 Moving away from tied loans as part of state debt management

The main reason for tied loans' influencing the state debt was a gap in the financial flow of investment projects: between the cash flow from the implemented project and its external state-guaranteed obligations, which the Government eventually began to finance. Of more than 30 investment projects implemented in Belarus in 2005–2019 on account of Chinese tied loans, the Government financed external obligations from the state budget for at least five. In addition, only a few investment projects achieved the planned revenue, value added, net income and exports, arousing doubts with regard to the mechanism of project realization and their system of business planning.

Problems in investment projects began to arise due to the poor quality of business plans, pre-project marketing research, forecasts of selling prices, underestimation of sales markets, competitors, the lack of legal and audit opinions or constructive dialog between the customer and the contractor, the occurrence of additional work after the initial project stage, the implementation of complex projects involving inexperienced state organizations, and the lack of expertise and control. That practice was typical not only for Chinese projects but also for others implemented as part of the Belarusian economy's modernization. Among the additional factors that aggravated the situation with the foreign currency state debt were the fall in export revenue in the traditional Russian market, and the chronic devaluation of the national currency.

Since 2012, the Government's external debt portfolio saw peaks in state debt payments. They were smoothed out by refinancing old external loans with new credits - both external and - more expensive - internal. An increase in the state debt

followed. For example, in 2012, a new external loan of $1.44bn was raised to repay $1.5bn and, in 2013, the return of $2.5bn was financed by $1.82bn external loans. In 2014, a new external loan of about $2bn was raised to pay for $2.7bn. New loans attracted from the domestic market were more expensive: their rates were 2–3 times higher than the repayable old external loans.

Moving away from tied loans did not envisage a ban on borrowing from China. It assumed a reduction in the number of new investment projects financed by tied Chinese loans, and an improvement in the terms of borrowing: the transition from attracting loans on commercial terms to preferential, from Government-guaranteed to non-guaranteed, from tied to unrelated.

Changes began developing along those paths and, since 2015, the number of new investment projects — financed by Chinese Government-guaranteed loans - has decreased 9-fold — to a single project per year. Since 2016, the amount of annual new Government and guaranteed loans attracted from China has halved, and, starting from 2018, the Government of Belarus ceased attracting new tied loans from China on commercial terms. Projects funded directly by China without a guarantee from the Government of Belarus were registered. Previously, there was the single example of Beltelecom, a company which purchased Chinese equipment using China Development Bank loans, without a guarantee from the Government. However, the situation changed, and, on April 25, 2019, the Belarusian Railway signed an agreement to attract 65.7 m Euros from Eximbank of China, under the guarantee of Belarusbank, rather than the government. In 2018, the Belarusian Government raised a preferential loan to finance a single project, while the preferential loans previously attracted to finance two projects in 2017 were canceled. Moreover, from 2017 to 2019, Belarus attracted two loans from China that were not related to project realization, and, as a result, the share of Chinese loans in the overall external state debt, and external debt guaranteed by Belarus, decreased slightly over the year: from 26% in early 2017 to 23% at the beginning of 2018. In 2019 China was among top three lenders of Belarus with amount of $3bn, to compare – Eurobonds $6bn, and Russia and Eurasian fund $11bn.

Of course, the move away from tied Chinese loans did not happen immediately. Moreover, that was politically at odds with the proposal announced in May 2015 by Xi Jinping to open new credit lines for $7bn. In addition, in accordance with their business plans, some Belarusian state-owned enterprises, such as MAZ, Grodno Azot, and others, continued to apply to the Government for state guarantees, and to Chinese banks for loans to implement their projects.

At the same time, for various reasons, the withdrawal from tied Chinese loans in Belarus began. Firstly, it was not Chinese companies that started winning tenders. Some, such as Slavkali, then passed a part of the work as a subcontract to China. Secondly, the Government of Belarus became stricter in its examination of the issue of state guarantees. Thirdly, the attractiveness of Chinese tied commercial loans began to decline due to the gradual growth of the base LIBOR rate (by 2.47%) from 2015 to 2018, as well as the appearance of alternative loans from international organizations (EIB, IBRD) with a longer term (up to 20–25 years), and a lower rate (1.6–2.6%).

3.2 Moving away from tied loans as part of Chinese import reduction

To answer the question of whether the withdrawal from tied Chinese loans can help reduce imports from China, it's better to look at the specifics and structure of the latter in Belarus.

As regards Chinese imports, more than 60% of goods come to Belarus from third countries. At the same time, these imports have steadily remained at this level

for a long time. According to the General Customs Administration of the People's Republic of China, and the State Customs Committee of Belarus, in 2006, imports of Chinese goods from third countries to Belarus totaled $332.9 m, or 60.7% of all imports of Chinese goods; in 2017, the figure stood at $1,905.3 m (67%), and in 2018 — $2,111 m (64.8%).

Imports of Chinese goods from third countries are mainly explained by logistics chains (deliveries via the Baltic ports, Russia), contracts concluded by Belarusian importers with regional representatives, dealers of Chinese companies in the EU, Russia and so on. This statistical detail is important to understand, since tied loans usually finance direct imports from China, which is no more than 40% of all Chinese imports.

The structure of Chinese imports in Belarus is highly diversified. In 2018, the country exported 884 products from China out of 1,172 supplied from around the globe (in 2008 this was 854 out of 1,149, in 2017, 871 out of 1,169). Given the absence of an official classification, Chinese imports can be divided into the three following groups.

3.2.1 Investment imports

It's been clarified that imports of goods alone from China depends on the cost of investment projects implemented through tied Chinese loans and direct investments by almost 30%. If we look only at tied Chinese loans, then we notice these have financed at least 20% of imports of Chinese goods in different years. A jump in investment imports has been observed since 2008, after the activation of major investment projects in Belarus, as confirmed by imports of such items as "communication equipment and parts", "computers", "parts for receiving and transmitting equipment" and "lighting equipment". In the following years, imports of these items became annual and predominant, and, in 2018, reached $606 m, or 18.6% of all imports of Chinese goods.

The dependence on cumulative Chinese imports of both goods and services at the level of over 20% of investment projects implemented with the support of tied Chinese loans was revealed. The correlation coefficient between imports of Chinese goods and services and the sample of Chinese loans provided to the Belarus' Government, or under its guarantee, was 0.93. The connection with services is explained by the fact that the main share of imports of Chinese services is taken by construction and architectural services (from 2010 to 2018, on average, 84.5% per year), used in the implementation of investment projects.

3.2.2 Intermediate imports

These are imports of components for machine-building and petrochemical enterprises. About 20% account for components and raw materials for industrial facilities in imports of Chinese goods. Among the largest Belarusian importers are industrial enterprises, such as Horizont, BelGee, BMZ, Yunison, MAZ, Grodno Azot, and others. For example, with an increase in the load of Belarusian production facilities and changes in the Russian market, Chinese imports of parts and accessories for cars and tractors are growing: from $27.1 m in 2008, to $67.8 m in 2012, $110.5 m in 2017, and $129 m in 2018. Further, the volume and share of imports of industrial components in the total imports of Chinese goods will grow along with the launch of production facilities created in Belarus by Chinese companies.

As regards imports of components for light industry enterprises, about 10–15% of imports of Chinese goods are made up of parts for shoes and knitwear, and other

components used in light industry. They are used in final production in Belarus and then re-exported to the CIS countries (Megatop is an example of such activity).

3.2.3 Consumer imports

Due to a great number of commodity items, it is difficult to accurately estimate consumer imports from China. However, its share is noticeable, even for certain products. For example, imports of woodworking products, such as "seat furniture and its parts" and "other furniture and its parts", accounted for $183.6 m in 2018, while imports of Chinese agricultural products in 2018 was $53 m (1.7% of total). Given high and growing wages in China, which averaged $918 per month in 2018, against, for example, the salary in Egypt at $183, consumer imports were later redirected to other countries [15].

Accordingly, the above-mentioned issue could have a solution. Moving away from tied loans in Belarusian-Chinese cooperation may reduce imports of Chinese goods and services by about 20%. However, with the simultaneous transition to more active investment cooperation between the two countries, Chinese imports may not decrease, but even increase. In this case, the dependence of imports on the implementation of investment projects does not decrease, since only the source of financing changes. When assessing the dependence of changes in imports of goods and services from China on Chinese direct investment, the correlation coefficient was 0.8. Taking into account the further development of the territory of the 'Great Stone' Industrial Park, and construction of facilities through technical and economic assistance from China, imports from China related to the implementation of investment projects will grow — increasing their share in total imports.

3.3 Transition from tied loans to untargeted credits

There are five ways to switch to unrelated loans.

3.3.1 Transformation of existing tied loans into unrelated credits

Speculation about the possibility of changing the terms of tied Chinese loans by extending the repayment period, reducing the interest rate, or obtaining a new unrelated loan from an old lender to refinance a previous loan, has not yet been confirmed in the practice of Belarusian-Chinese relations. Attempts to negotiate failed. On the one hand, it is impossible to exclude the lack of reasonableness and perseverance of the Belarusian side, and, on the other, an excessively principled attitude and the threat of default on the Chinese side. In any case, the experience of other countries in improving the terms of tied loans and converting them into untargeted ones, as well as the positive experience of Belarusian banks in this matter (more details below), cannot be excluded from the Belarusian-Chinese agenda.

3.3.2 Attraction of an untargeted loan at state level

As a rule, China prefers a uniform approach when discussing this issue in order to avoid precedents and a queue of so-called exceptions consisting of other countries. Therefore, if unrelated loans are provided by China at the state level, then they are provided in a closed mode, for a short period of time, and indeed, as an exception. A potential lender of unrelated state loans from the Chinese side may be the Ministry of Finance of the PRC - as a manager of budget resources, which can provide a loan directly or, for example, through Eximbank of China. Another possible lender may be the State Administration of Foreign Exchange of the People's

Republic of China, which is subordinate to the People's Bank of China as the manager of currency resources.

3.3.3 Interbank lending

There are opportunities here to use the acting exchange agreement for 20bn Yuan signed on March 11, 2009 by the National Bank of Belarus and the People's Bank of China to provide monthly, three-monthly, and six-monthly loans in Yuan. In addition, direct interbank unrelated loans are provided by Chinese banks for short-term trade finance purposes within open limits.

There is also an option to transform part of the interbank credit line, opened under the guarantee of the Government of Belarus on May 10, 2015 by China Development Bank for the Development Bank of Belarus, to the amount of $700 m and $300 m for Belarusbank to finance joint investment projects, into an unrelated loan. For example, on March 1, 2017, Belarusbank transformed part of this credit line by attracting an unrelated three-year loan of $100 m from the China Development Bank. Later, on the basis of established cooperation, Belarusbank attracted a new unrelated loan of 100 m Euros from this Chinese bank under a government guarantee on April 24, 2019.

Of course, Chinese banks are interested in providing loans to the most reliable borrower in Chinese Yuan to enhance the internationalization of the latter. In this regard, on December 16, 2019, the China Development Bank provided an unrelated five-year loan to Belarus' Finance Ministry, to the amount of 3.5bn Yuan (around $500 m).

3.3.4 Issue 'panda bonds' on the mainland market of China

'Panda bonds' can be placed on the interbank market, which occupies 90% of the issue, as well as on the Shanghai and Shenzhen exchanges. At the same time, it is desirable that the first issue should be conducted by a sovereign borrower in order to provide guidance for other entities. For example, on December 15, 2015, the South Korean Government issued three-year "Panda bonds" worth 3bn Yuan, at a rate of 3%. On January 21, 2016, a three-year issue of 3bn Yuan was held by the province of British Columbia (Canada), at 2.95%. On August 26, 2016, the Polish Ministry of Finance issued three-year bonds worth 3bn Yuan, at a rate of 3.4%. As for corporate issuers, the experience of Russian RUSAL might be useful: in March 2017, it conducted a three-year issue worth 1bn Yuan, at a rate of 5.5%. At the same time, this Russian company received a rating from the Chinese Agency CCXC in June 2016; it turned out to be higher than the sovereign rating of the Russian Federation [16]. German Daimler, French Veolia Environment, Air Liquide, and Mongolian Bank TDBM also attracted unrelated loans from China's financial markets.

3.3.5 Issue of 'dim sum bonds' in Hong Kong

From 2006 to 2015, the Hong Kong financial market was more attractive to issuers than the mainland, but with the growth in the number of issues of 'panda bonds', the rates in the two markets began to equalize. In 2015, the SSA Korea Development Bank (with a rating similar to the sovereign) issued three-year 'dim sum bonds' worth 1.38bn Yuan, at 4.2%, while SSA Export Development Canada issued 0.8bn Yuan at 3.53% per annum. The long-term trend of the Chinese Yuan shifting from revaluation to devaluation in 2016 increased the attractiveness of 'panda bonds' in comparison with 'dim sum bonds'. As a result, in 2016, the average rate for 'panda bonds' was 4.3%, and for 'dim sum bonds' it was 4.75% [16].

To enhance the attractiveness of its market, the Hong Kong authorities provide subsidies for the debut issue of 'dim sum bonds'.

Actually, the transition from tied to unrelated loans changes the lender's priorities from microeconomic to macroeconomic risk. To assess Belarusian macro-risks, a Chinese lender uses both the ratings of its own foreign institution in Belarus, and the sovereign credit ratings of international agencies. Interestingly, over the course of time, Belarusian macro-risks have not changed significantly. Back in 2011, according to Chinese embassies, a list of investment risks in Belarus was compiled; it is still relevant today. Among them are regulatory risks - the lack of a clear and real plan for economic development, and the presence of many pilot projects; economic (energy dependence on Russia); political (state interference in economic activities which leads to corruption and increased investment costs); and legal (the law enforcement system is complex and subject to frequent changes) [17].

What has changed in Belarusian macro-risk? What has stimulated the transition of Belarusians and Chinese to unrelated loans? Was it the improvement of the sovereign credit rating in October 2019 from B- (Stable) to B (Stable), the stabilization of the exchange rate, or the reduction of inflation to a single-digit parameter? All these are indicators that bring Belarus' macroeconomic environment closer to the global norm, rather than giving it a competitive advantage. Synchronization of the macroeconomic risks of Belarus and Russia in the context of a common environment of international sanctions, political discussion of integration, and the common correlation of commodity and currency markets, could be one of the most accurate explanations. As a result, for example, international investors began viewing Belarusian Eurobonds as Russian with an additional risk (plus 200–300 basis points). Chinese lenders also look at the possibility of providing unrelated loans to Belarus in the same way: through the prism of Russia and its risks, of which they have better knowledge.

3.4 Transition from credit cooperation to direct investment liaisons

In September 2016, Belarus' President Aleksandr Lukashenko paid a state visit to China to propose that Chinese Chairman Xi Jinping switch to bilateral cooperation from credit to direct investments. Three years later, the number of new tied credit agreements guaranteed by the government had virtually come to naught, while the volume of Chinese direct investments in Belarus increased. While talking to Aleksandr Lukashenko during a bilateral meeting in Beijing, in April 2019, Xi Jinping noted that China was supporting the transition to investment cooperation. Following the results of 2019, it's possible to conclude that the transition from credit to direct investments cooperation between Belarus and China was realized: the share of Chinese direct investments (against the total volume) to Belarus reached 83% in 2019. In 2018, this figure was 55% and in 2017, it stood at 41%. The remaining share accounted for credit instruments.

While credit and investment cooperation was being established, credit relations were in focus. Accordingly, projects with Chinese direct investments in Belarus were rare: i.e. the Midea-Horizon joint venture producing household appliances, the Volat-Sanjiang joint venture with the Minsk Wheel Truck Plant (MZKT), the Beijing hotel complex and the Lebyazhy residential complex. From 2007 to 2009, Belarus received $2.6 m of direct investments from China. In 2010, the figure rose to $28.3 m and, in 2011, it reached $44.3 m. From 2012 to 2013, $78 m were registered annually. Apart from reinvesting the existing investors' profits, new projects were registered: i.e. the BelGee Automobile Plant was established jointly by BelAZ and Geely.

Chinese direct investments were headed to Belarus, in the initial period of their accumulation, for two reasons. The first was a political factor which envisaged the construction of facilities within the framework of implementing agreements reached at top level meetings. The second reason was the Chinese companies' combined implementation of projects involving tied loans and direct investments. For example, CAMCE, which acted as the general contractor for the Svetlogorsk Pulp and Board Mill project, financed by loans from Eximbank of China and ICBC, was also a direct investor in the joint venture of the 'Great Stone' industrial park development. In turn, CUEC oversaw the electrification of the railway and supply of electric locomotives at the expense of loans from Eximbank of China, and then established a company to service its products in Belarus. Similarly, BelGee and the joint venture for the 'Great Stone' industrial park development, at the initial stage of their direct investment, attracted loans from China under the guarantee of the Government of Belarus.

In the new era, the 'Great Stone' industrial park has become the key 'magnet' for attracting Chinese direct investments to Belarus. A joint company was set up to develop the Industrial Park, and, on the launch of the infrastructure, the first residents and direct investors came from China. As a result, in 2014, FDI from China to the Republic of Belarus amounted to $164.5 m; in 2015, $77.7 m was registered. From 2016 to 2018, the Industrial Park's territory continued to be worked on, and a greater number of Chinese residents were registered. A shift in the annual flow of Chinese direct investments to an historic maximum of $190 m was seen in 2018. Regarding the net figures, those investments increased almost 3-fold to $112 m. In 2019, Chinese direct investment fell slightly to $141 m, including $107 m on the net basis, due to the completion of some major projects by Chinese investors, in the Industrial Park and beyond, i.e. Belkali-Migao.

As a result, from 2016 to 2019, Belarus received a total of $545 m, or more than half (53%) of all Chinese direct investments which came to the country during the period of their accumulation, from 2007 to 2019. China ranked 6th among other countries in terms of FDI to Belarus and was 3rd in net FDI (behind neighboring Russia and offshoring Cyprus).

To the naked eye, the significance and growth of FDI from China in Belarus against other countries seems small. Chinese direct investments in Belarus accounted for only 2.23% of total FDI in 2018 (1.07% in 2015). In addition, in 2017, China directed $0.11bn of direct investments in Belarus, against $6.4bn to the US, $2.7bn to Germany, and $2bn to the UK. Looking at the relationship of Chinese direct investments to the recipient country's GDP (assuming that FDI mainly depends on the sales market), a different picture is seen. From 2013 to 2015, Chinese direct investments to GDP in Belarus, the United States, Germany, the United Kingdom, and the world as a whole, were at a comparable level: 0.05–0.07%. From 2016 to 2017, this indicator for all the countries under consideration and the world as a whole, increased to 0.09–0.1%. In 2018, Belarus experienced a significant shift, when the indicator of FDI from China to Belarus' GDP exceeded 0.2%. The relationship of Chinese direct investments to Belarus' GDP can be traced to the period from 2007 to 2015, with a correlation coefficient of 0.82. When adding another period, from 2016 to 2018, this relationship actually disappears, with a coefficient of 0.38, due to the shift in recent years of Chinese direct investments towards the 'Great Stone' industrial park. For example, even in 2017, the share of Chinese direct investments to the Park, against all those received from China, was 23%; in 2018, it reached 42% and, in 2019, 57%. In 2019, five of the ten largest direct Chinese investors in Belarus were residents of the 'Great Stone' industrial park.

The role of the 'Great Stone' industrial park in the transition from bilateral credit cooperation to direct investment cooperation is constantly enhancing and changing and deserves separate analyses.

4. China-Belarus industrial park 'Great Stone' and its role to avoid the "debt trap"

4.1 Overview of the role models

The idea of the China-Belarus industrial park was put forward following the visit of Xi Jinping, in his capacity as Vice-President of the People's Republic of China, to Belarus in March 2010. In September 2011, the Government of the Republic of Belarus and the Government of the People's Republic of China signed an agreement on the development of the China-Belarus industrial park.

The 'Great Stone' industrial park was originally established in Belarus within the framework of China's general policy of setting up its industrial parks in foreign countries. Since 2006, China has launched active efforts to establish industrial parks in Angola, Pakistan, Thailand, Venezuela, Vietnam, Cambodia, South Korea, Egypt, Zambia, Nigeria, Mauritius, and Ethiopia. Following the establishment of the ASEAN-China Free Trade Area in 2010, the plans for the construction of joint industrial parks in every ASEAN member state were made public. Despite the general policy, there was no uniform mechanism for the establishment of those parks. They varied in size, investment arrangements, specialization, and level and type of government support. And yet, during his state visit to Belarus in May 2015, President of China Xi Jinping called the China-Belarus industrial park "the Pearl on the Silk Road", thereby singling it out from the field of China's industrial parks and linking it to a different overseas strategy of China. Furthermore, it is remarkable that, as noted above, the idea of establishing the Industrial Park emerged in 2010, while the "Belt and Road" initiative followed in 2013. The 'Great Stone' industrial park has become a major project of Belarus-China cooperation and was presented at the international forum "Belt & Road" held in Beijing in May 2017.

Initially, the case of the China-Singapore industrial park in Suzhou was used as a model by the China-Belarus industrial park. The former was started in China in 1992 as a follow-up to the meeting of Deng Xiaoping with Lee Kuan Yew. The leader of Singapore stressed that it had been very difficult for the Chinese officials to adopt the best Singaporean practices during their regular business trips abroad. In this regard, Singapore, together with China, would establish an industrial park, and transfer its managerial skills in the process of its development and operation. The intergovernmental agreement on the establishment of the China-Singapore Industrial Park was signed in 1994. This park has gone through challenging establishment and development stages, including overcoming the distrust of the population, the creation of parallel parks, negative earnings, and all the rest of it. For instance, the losses faced by the joint venture managing the China-Singapore industrial park in its early years led to a situation where the Singapore side started selling its shares and exiting the project. Today this industrial park is one of the most successful in China. Its membership includes nearly a hundred Fortune-500 international corporations. The secret of its success is the application of the 'one-stop shop' principle (quick resident registration), tax incentives for producers of innovative products, manufacturers of integrated circuits and software, and small businesses. The experience of the Suzhou industrial park in the sphere of tax incentives provided an example for the 'Great Stone'. The tax benefits have been significantly expanded to the '10 + 10' format: 10 years tax-free, and half the tax

rate for the next 10 years. In addition, the Decree of 2017 covered the 'one-stop shop' principle by analogy with the China-Singapore industrial park.

Since the beginning of the Park's active development, from 2013 to 2019, there has been an understanding that the 'Great Stone' is more of an experiment to improve Belarus' investment climate in several areas:

- to reduce the high and complex national tax burden for investors, unprecedented privileges are applied at the Park: exemption from income tax for 10 years from the date of receipt, and then, payment of half tax until 2062, as well as abolition of real estate tax, land tax, VAT privileges, and other tariffs;

- to overcome bureaucratic barriers, reduce approval time, and cut transaction costs, the Park has introduced the 'One Stop Shop' for quick and simplified assessment of documents and registration of residents;

- to lessen state interference and pressure on the economy, private ownership of land, simplified construction regulations, and a ban on inspections by regulatory authorities without the permission of the Park Administration, have been introduced.

The fundamental issue for the success of the 'Great Stone' is who acts as the main contributor of managerial skills, technologies, and international values, that are to be fostered in the Belarusian staff of the industrial park. At this point, certain difficulties were experienced. Initially, the major shareholder (60%) of the administration company representing the Chinese side was CAMCE, sponsored by its parent corporation, SINOMACH. However, CAMCE is an engineering company and has a vested interest in Belarus, in the form of a contracting project at Svetlogorskiy Pulp and Paper Integrated Works, and no expertise in setting up industrial parks. In 2014, the shareholding structure of the Chinese side was changed following the visit of the Vice-Prime Minister of China, Zhang Gaoli, to Belarus. The share of CAMCE was reduced to 45.7%, and one new shareholder, China Merchants Group, entered the venture with a 20% share. The aim of changing shareholders was to boost technology inflow and direct investments into the 'Great Stone' industrial park.

4.2 The 'Great Stone': the potential of high-tech hub

The 'Great Stone' industrial park's key focus on the high-tech industry is reflected in the fact that it was established in Belarus just for this purpose, namely, to bring in high-technology industries. Several studies conducted in Belarus show that China has surpassed Belarus by many innovation indicators [18]. This gives reason to hope for an inflow of Chinese technological investments to the industrial park. At the same time, it depends on Belarus' industrial needs rather than on China's technological capabilities. In this regard, the industrial park, with respect to the tax benefits granted for a period of twenty years, and its legal regime extending to a period of fifty years, must be an element of Belarus' industrial strategy for no less than a twenty-year period. Meanwhile, such a strategy, capable of fostering new growth areas, is hardly in evidence, and the emphasis is rather on preserving the existing production facilities.

The Regulations on the China-Belarus industrial park, approved by the Resolution of the Council of Ministers of the Republic of Belarus, No. 756, dated 16 August 2012, specify the following priority activities of the industrial park: electronics, fine chemicals, biotechnology, engineering, and advanced materials. Still, according to some sources, the nature of the new world industry in the next ten

years will be determined by such sectors as robotics, genetics, and big data processing, accompanied by the codification of money and markets [19–21]. CEOs of transnational corporations in China, the US, and the EU, forecast the development of such sectors as data processing systems, the Internet of Things, etc. [22].

The new Decree of 2017 does not specify, but rather eases, technological requirements for accession to the 'Great Stone' industrial park. However, this is not a fundamental concern. In any case, in order to ensure its innovativeness, the 'Great Stone' would focus more specifically not on implementation of domestic technologies, but on the transfer of advanced foreign ones. This would call for an appropriate infrastructure for their transfer, development, and commercialization. Moreover, the ultimate goal of the Industrial Park should be the creation of an environment favorable for home-grown innovations and the emergence of competitive domestic technologies.

Alongside the hope that China would focus its high-tech investments on Belarus, there are arguments to the contrary.

Firstly, in recent years, there has been an outflow of productive assets from China to nearby countries (for instance, Vietnam, Bangladesh) that demonstrate a better balance of costs and productivity than China (and Belarus). This is especially the case for the labor force.

Secondly, there is a discussion that Western companies that came to China in the 1990s and 2000s might go back to developed countries [23]. This is due to the development of robotics there, when the price of robots declines over time as their performance improves (in accordance with Moore's law). To remain competitive, China also prioritizes robotics: the annual growth of this sector in China in recent years has been 25% [20]. In view of the foregoing, China's priority may shift in the long run, from offshore manufacturing towards the retention of companies inside the country in order to maintain jobs and social stability. In this regard, China and Belarus are actually competitors for technology, while the 'Great Stone' serves as a means of attracting primarily international, rather than just Chinese, technological investments.

For the 'Great Stone' to create a corresponding high-tech eco-system, it needs a university. Silicon Valley has become successful thanks to Stanford, Boston, Harvard, and MIT. Hong Kong has achieved similar success thanks to the cluster of its universities and London to its business school. The opening of a branch of a world university in the 'Great Stone' will make it possible to solve at least two problems. It is primarily technological, dealing with the creation of a scientific and technical research base for the development of new high technologies and their commercialization in the Park. According to a survey conducted on the basis of the UK's experience, the growth of state investment in research universities leads to an increase in the national economy's labor productivity by 20%, with a three-year lag. When evaluating 135 universities and colleges in 85 US districts, a correlation was established between the growth of research expenses and the level of income in the district, which persists for at least a five-year period. This dependence increases if a university is research-oriented, and if a region is aimed at the implementation of these studies [24].

Another aspect is educational. It aims to attract talent (scientists, teachers, students), and organize the training of highly qualified specialists in the 'Great Stone'. This will generally increase exports of Belarusian educational services by attracting more students from China and the Eurasian region, while training personnel for projects along the 'Belt and Road' and increasing the prestige of Belarusian higher education. However, investments in education without appropriate changes to the sectoral structure of the Park and the country to create a demand for the skills being trained, will only lead to emigration [25].

4.3 The 'Great Stone': the potential to attract direct investments and avoid the "debt trap"

Russian Kaluga oblast, with one million inhabitants, could be an example of foreign direct investment mobilization for the 'Great Stone'. It has succeeded in attracting over USD 1 billion owing to its industrial parks. Another example is the mentioned Suzhou industrial park, with an index of 'investment density' of over USD 1.7 bln per square kilometer. At the same time, care should be taken to distinguish between investments for the establishment of a park and investments into an already established park:

4.3.1 Investments in the establishment of the industrial park

The cost of modern infrastructure for a technological park is continuously increasing. For instance, 20 years ago, the average cost of one square kilometer of internal infrastructure of an industrial park in China was $23 m, while at present, that average indicator is up to $80 m. If take into account the territory of 'Great Stone' is around 100 square kilometers then the total amount of investments should be around $8bn. Nevertheless, the expected size of Chinese investments into the 'Great Stone' infrastructure might prove to be overoptimistic. First of all, in many foreign industrial parks and Belarusian free trade zones, the infrastructure, together with 'amenities' options, is provided by the state, free of charge. Therefore, major foreign investments flow into already operating industrial parks rather than into those being established. Secondly, China's *de facto* investments into overseas industrial parks under construction are normally lower than planned [26].

In the case of 'Great Stone' in 2013–2019, about $500 m was invested in this Park on a long-term basis to develop infrastructure. Of this, 3.6% was funded by Belarus, and rest financed by China. $113 m was part of the budgetary resources of the two countries, including the Government of Belarus ($18 m), the Government of China ($20 m in the form of technical assistance) and privileged loans by the Government of China to the 'Great Stone' Development Company under the guarantee of the Government of Belarus ($75 m). The remaining share accounts for foreign direct investments that came to the Park through Chinese shareholders. In 2013–2015, China invested $25.7 m in the Park, but, in 2016–2019, over $100 m was injected or around $25 m per year. The joint company for park development was, in fact, the key investor in the first three years of the Park's development, directing its long-term investments to the infrastructure creation.

4.3.2 Investments into the established industrial park

In 2013–2015, seven companies were registered in the Park, including six from China, but, in 2016–2018, 34 new residents joined (with 18 from China). Over those three years, the Park's residents became its main investors, most of whom were at the stage of design, construction, and equipment of facilities. However, even against an increase in the number of residents and the volume of investments in the Park, the so-called 'dead investments' - companies that registered but failed to start their operation, or worked slowly - also joined. Therefore, in early 2020, two residents were deprived of their status, and, by April 2020, the Park had a total of 59 companies, including 34 which were Chinese. The Park's Chinese residents invested $22.7 m in 2017, and $70.5 m in 2018. In 2019, the figure reached $80.4 m.

The existing minimum threshold for authorized capital in the Park ($5 m), against a small Belarusian sales market, takes residents into a production trap. Why are large capacities needed if a big sales market is now available? There are several

ways to get away from this trap: either to lower the threshold for joining the Park (in this case large industrial companies will become small and medium-sized, assembling and creating small added value in the international production chain), or expand the sales market.

In line with the Park's business plan dated 2014, the EAEU and the EU were considered target markets for its residents. Since 2015, the external economic situation has changed: a trade war between Russia and the EU and mutual financial restrictions between Russia and the US began, import substitution intensified in Russia, similar industrial clusters competing with the Park were launched in Russia and Kazakhstan, and numerous trade barriers and contradictions remained in EAEU. All these elements push investors to look for new options for selling their products. For example, the largest and most active Chinese residents of the Park, Weichai, its Shanxi subsidiary Fast Gear, Zoomlion, and Chengdu Xinzhu, started to liaise with Belarusian MAZ and Belkommunmash, providing them with their products as components for the further sale of joint goods in the traditional markets of the Belarusian partner.

According to the business plans of the Park's residents, the EAEU, China, the EU, and the CIS, are viewed as priority sales markets. New opportunities are opened by the China-Europe-China trade route passing through Belarus; a trade war between the US and China which makes it possible to use the Park in Chinese-American trade; and the changed structure of China's economic growth from exports to imports. In this regard, the attraction of high-tech European and American residents with the orientation of their products on the Chinese market may become a new priority for the Park's development.

To assess the effect of such a scenario, it is necessary to look at which European and American goods China imports. In 2017, China's import revenue from the EU was $245bn, accounting for 1,151 commodity items. Of these, 45 product groups, with a share of 0.5–11%, comprised equipment, machinery, apparatuses, chemical, agricultural, and woodworking Products. *china*'s imports from the US the same year reached $154.4bn, involving 1,122 commodity items; 44 were product groups enjoying a large share of 0.5–9%. Many products were similar to those imported from the EU. Comparing the volume of China's imports of major product groups, taking into account the priority areas of the Park's activities, and its ability to register about 500 residents, the potential for the Park's exports to China could be up to $34bn (depending on localization and other factors). The most-favored-nations regime is applied to goods originating in, and imported into, China from Belarus. With an average tariff of 4.4%, taking into account the structure of imports, according to the Ministry of Commerce of the People's Republic of China, the creation of a free trade regime between the Park and China will annually save at least $1.5bn.

The creation of the 'Park-China' free trade regime envisages the transformation of the 'Great Stone' into an industrial offshore site. This will require — primarily, from Belarus – the correction of national legislation, and negotiations with the WTO to obtain the right for the Park to be an independent customs territory for concluding agreement on a free trade regime with China, the EU, the US, the EAEU, and other countries and regions. The creation of a free trade zone for China and the EAEU, taking into account the structure of their trade, has now more advantages for China than for the EAEU member-states. About 70% of EAEU exports to China are mineral resources, while about half of Chinese imports comprise machinery, equipment, and mechanisms. To avoid an industrial shock due to lowered customs tariffs, the EAEU is restricting the process of creating a free trade zone and, on May 17, 2018, a non-preferential agreement on trade and economic cooperation between the EAEU and China was signed, which does not imply an automatic reduction of trade barriers, is sectoral, and contains many reference norms to the WTO agreements,

including for the Republic of Belarus, which is not a member. The prospects for creating a fully-fledged free trade zone are still very ambiguous [27]. It is important to note that the long-term scenario of China's trade rapprochement with the EAEU may lead to a dulling of external incentives in the EAEU to change the structure of the economy and exports, and, accordingly, to its long-term 'freezing' and maintaining China's competitive advantage over the EAEU. In case of the accelerated creation of a free trade zone, the EAEU authorities may react to an external shock, adjust regulation, and improve the structure of the economy.

The experience of the countries that created a free trade zone with China demonstrates that supplies to the Chinese market are growing, though not necessarily immediately. For example, Georgia has experienced this already. On September 10, 2015, the prime ministers of Georgia and China met in China to agree on the creation of a free trade zone. In February–September 2016, three rounds of negotiations and two working meetings took place and, on May 13, 2017, the Minister of Commerce of the PRC, Zhong Shan, signed an agreement in Beijing with his colleague on the creation of a free trade zone between the PRC and Georgia. In line with this document, 94% of goods and services are delivered duty free. The agreement entered into force on January 1, 2018 and, according to the National Statistics Service of Georgia, in 2018, Georgian exports to China dropped to $198 m ($201.7 m in 2017) but increased in 2019 to $227.6 m.

In conclusion, it is important to note that with the current speed of Chinese direct investments inflow into the 'Great Stone' (around $100 m per year) it could be possible to ease Chinese debt burden but hard to avoid overall "debt trap", while the country needs to pay back its state debt of more than $3bn average per year during 2021–2025. So in order to attract bigger FDI and increase the role of 'Great Stone' in avoiding not only Chinese but general external "debt trap" the Park should be opened to bigger markets for example with the free trade agreement with China.

5. Conclusions

Debt financing of nation building in developing countries hides the risk of "debt trap" due to underdeveloped local institutions, low level of domestic savings, incompetence of authorities in debt management [28, 29]. Facing the debt challenges developing countries are tempted to put the blame on the lender, this time it's China in described cases of Sri Lanka, Pakistan, and Ecuador. Nevertheless looking carefully through the parts of Chinese "debt trap" it's seen that the customer makes the choice on the project, the contractor, and the lender, while China's terms are competitive. It is usually hard for developing country voluntary start debt reduction, so they got into "debt trap" [30].

Since 2005 Belarus attracted Chinese tied loans and funded this way more than 30 investment projects. When 5 out of them constructed by Chinese contractors could not accumulate foreign exchange revenues to repay Chinese debt, the Government of Belarus implemented the policy of avoiding "debt trap". There are 4 channels used by Belarus: 1) moving away from tied loans as part of state debt management; 2) moving away from tied loans as part of import reduction; 3) transition from tied loans to untargeted credits; and 4) transition from credit cooperation to direct investment liaisons.

Sino-Belarus industrial park 'Great Stone' is meant to play the key role in bilateral transition from credit to direct investments cooperation in order to ease debt burden. Using the role model of Singapore-China industrial park, 'Great Stone' is established to reduce the high and complex national tax burden, overcome bureaucratic barriers, lessen state interference and pressure on the business activity and

in general transfer Belarus behavioral state economy into classical market oriented [31]. As the Park is focused on new technologies the opportunity to become high-tech hub can be fulfilled through establishing University in the Park. Investment potential of the 'Great Stone' is limited by the scale of sales Belarusian and Russian market. The current speed of Chinese direct investments into the 'Great Stone' industrial park cannot solve the challenge of high annual state debt repayment during 2021–2025. So some measures need to be taken like signing free trade agreement between 'Great Stone' and China in order to attract American and European enterprises to open their production bases in the Park to export to China.

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Chapter 5

Impact of Oil Price Fluctuation on the Economy of Nigeria, the Core Analysis for Energy Producing Countries

Jelilov Gylych, Abdullahi Ahmad Jibrin, Bilal Celik and Abdurrahman Isik

Abstract

The study aims to find the short-run empirical analyses of the impact of oil price fluctuation on the monetary instrument (Exchange rate, Inflation, Interest rate) in Nigeria. We explored the frequently used Toda–Yamamoto model (TY) model, by adopting the TY Modified Wald (MWALD) test approach to causality, Forecast Error Variance Decomposition (FEVD) and Impulse Response Functions (IRFs). The study covered the period 1995 to 2018 (monthly basis), and our findings from MWALD test indicated that there is a uni-directional causality of the log of oil price (lnoilpr) to log of the exchange rate (lnexchr) at 10% level of significance, also there is a contemporaneous response of log of consumer price index (lncpi) to log of exchange rate (lnexchr) and log of interest rate (lnintr), and jointly (lnoilpr, lncpi and lnintr) granger cause lncpi. Also at 5% level of significance lnintr responded due to positive change in lnoilpr and lnexchr, and jointly causes lnintr at 5% level of significance. This is complimented with our findings in FEVDs, and IRFs. The empirical analyses shows that oil price is a strong determining factor of exchange rate, cost of borrowing and directly influences inflationary or deflationary tendencies in Nigeria.

Keywords: oil Price, exchange rate, inflation, interest rate, Toda–Yamamoto

1. Introduction

Crude petroleum is one of the fundamental sources of energy in the world and plays an important role in economic growth and development of many economies. Because of the need for this product, the oil market is subjected to the market forces of demand and supply, which do lead to the fluctuation in the pricing. Hamilton [1], Blanchard and Gali [2], viewed, changes in the price of oil as an imperative source of economic fluctuations, in which the resultant effect led to global shock, capable of affecting many economic activities instantaneously. This shock is perceived generally to have a similar impact due to events like fall in growth rate, high unemployment rate, and high inflation rate, while the magnitude and the causes

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of the effect of these shocks may differ. For import-based economy, hike in the oil price will lead to shock in the economy, vice versa for the export-based economy [1, 3].

There are many established empirical analyses on the macroeconomic consequence of oil price shocks to net exporting countries, this is based on the dependency between oil price and the business cycle which can be explained through the impact of the oil price shocks on aggregate demand. Practitioners opined that an increase in oil price reduces aggregate supply since high energy prices mean that firms will purchase less energy. As a consequence, the productivity of any given volume of capital and labor will decline and leads to potential output loss. This invariably will lead to a decline in factors of production and real wages ([4, 5], p. 23; [6, 7]).

To expatiate further the influence of the oil price shocks on aggregate demand, Riaz et al. [5] submitted that oil is one of the basic inputs in manufacturing industries, any positive oil price shock increases the cost of manufacturing. As the cost of manufacturing rises the profit margins on investments fall will influence investors to postpone their irrevocable investments. Reductions in investment causes cuts in production level, consequently exports of the country are negatively affected and economy has to face adverse balance of trade. So also the effect permeates into households, oil price fluctuation induces the consumers to reschedule their expenditures on durable goods. This suggested that oil price shocks have serious concerns for all types of economies as aggregate demand is reduced from both consumption and investment sides. Increase in both oil prices and uncertainty in oil prices is detrimental for the economy (p. 24).

The negative effects of oil price shocks are more on the net-exporters of oil of the developing economies, the effect could be attributed to over-dependence on oil revenue, importation of basic necessity and susceptibility of their tradable lagging sectors to Dutch disease syndrome, the consequences of externalities, and economic pass-through (inflation) [8–12].

In the submissions of Abeng [8], opined that theoretically, an increase in oil price should reflect more revenue dividend for oil-exporting countries as it is expected to enhance foreign exchange earnings and build reserve in the short-run. Conversely, for net-importers of refined petroleum products for instance Nigeria with domestic regulation of oil prices (subsidies), oil price increase may not transform to the anticipated economic advantage, due to fiscal difficulties, restraining government's ability to finance import in addition to meeting other international obligations (p.3). Nigerian has a deficit of ₦7114.49 and ₦8324.76 billion Naira for 2017 and 2018 periods for importation of non-oil products and spent about ₦2618.97 and ₦3833.82 billion on importation of refined petroleum product for the period of 2017 and 2018 [13]. These figures stress the vulnerability of the economy to the impulses of international oil price. The consequences may be unfavorable to economic growth arising from increased domestic production cost and decline in aggregate demand (p. 23).

In Ibrahim [14] remarks in studying the responses of non-oil productive sectors that is agriculture, manufacturing and service to shocks in change in oil price in Nigeria. In his submissions, the results obtained reveal that oil price impacted positively on aggregate output but negatively on agricultural, manufacturing and service sector suggesting that at the aggregate level, oil price is incline to increase aggregate output whereas an increase in oil price impacted negatively on the outputs of productive sectors as oil serves as an input factor in the production process of these sectors. This specifies that fluctuation in oil price creates uncertainty in the production capacity of the productive sectors and it also

destabilizes the effectiveness of the government fiscal management of crude oil revenue.

Also Ayadi [15] posited that the forecast errors in industrial production are credited to volatility in real exchange rates and that changes in oil prices are only slightly important in influencing industrial production in Nigeria. Moreover, oil price changes affect real exchange rates, which, in turn, affect industrial production. He remarked that it should be noted that the indirect effect of oil prices on industrial production is not statistically significant. Therefore, the implication of the results presented in his paper is that an increase in oil prices does not cause an increase in industrial production in Nigeria.

According to [16, 17], the economy of Nigeria was affected by the decline in the revenue due to a fall in the price of crude oil alongside production. They cited that in about twenty months, the oil price has nosedived rapidly from as high as about one hundred and thirty dollars per barrel to as low as twenty-eight dollars and quantity also dropped from 2.15 Mbpd to 1.81 Mbpd in the earlier months of 2016, this resulted to a recession.

The crude petroleum industry is among the largest contributors to the economic growth, before the recession experienced by the country, in 2016 the growth rate shrank by −13.65%, a more substantial decline than that in 2015 of −5.45%. This reduced the oil sectors share of real GDP to 8.42% in 2016, compared to 9.61 per cent in 2015, (NBS, Q4 [18]). Aside from the contribution to the growth rate, the industry affects monetary variable and high unemployment rate [2]. According to Nweze and Edeme [19], as quoted by Adedokun [16], CBN [20] opined that on average, 75% of government revenues and on average 93% of foreign earnings from trade in goods and services, in the last ten years come from oil export, which informs part of the major sources used in financing the country's imports.

2. Literature review

Fluctuate in the price of natural resources is a term more related to the oil shocks because the majority of the problems encountered concerning recession is aggravated by a change in oil price. Hamilton [1], in his abstract, he opined that historical oil price shocks were principally caused by physical disruptions of supply, the price hike of 2007–2008 was caused by supply not meeting the excessive world demand. The consequences of recession are very similar with significant effects on consumption. According to Hamilton (1983) as cited by Sabiu [21], opined that ten out of eleven economic recessions were preceded by a sharp increase in oil prices in the United States.

Although, In a more recent development in the investigation of the causes of oil price shocks, many practitioners do not see supply as the sole cause of oil price shocks. The neo-monetarist, the likes of Bernanke et al. [22] sees oil and energy costs as insignificant relative to total production costs to account for the entire decline in output that, at least some events, has followed increases in the price of oil, they foresee that the monetary policy taken during spikes in the price of oil as the major contributing factors to the economic shocks.

Kilian [23] opined that historically, the decompositions of fluctuations in the real price of oil shows that oil price shocks have been driven mainly by a combination of global aggregate demand shocks and precautionary demand shocks, rather than oil supply shocks.

In furtherance to clear the air on the causes of oil price fluctuations, which was generally believed to have outgrown the traditional demand and supply

factors, Humbatova and Hajiyev [24] made references, to the Er-Riad summit of 2007 where conclusions where reached on the oil market trend that, it is not related to OPEC decisions. They concluded that the current trend is due to financialisation factors, lack of production capacities in oil production, reduction in the world oil reserves, natural disasters, political events and processes.

The financialisation of oil market made oil a speculative commodity in the financial market contrary to the real commodity. This has been one among the major sources of oil price volatility [25, 26].

The exposure of the oil market to commodity market brought about the issue of speculation, that is investors' expectations about future oil supply and demand. This breeds in the issue of inventory, either below or above the ground since oil can be stored. Others factors are the price of dollars, for net oil importers appreciation of dollar mean lower consumption of oil whereas the net exporters mean more revenue from the sales of oil, the reverse is the case when dollar price depreciate [26, 27].

The most recent factor in the front burner affecting fluctuation of oil price is the improvement of shale-oil technology (the shale revolution in the United States). The technological innovations that decreased the liquid fuel consumption and influenced the global energy markets to the point that many countries that are solely dependent on the oil resource plunged into economic crisis in 2016 due to falling in oil demand [26, 28]. Davig et al. [29] added that the fall in demand led to shifts in precautionary demand in the mid-2014 to mid-2015, this played a fundamental role in driving oil prices lower due to market glut and exacerbate the oil crisis to net exporters in 2016.

Fluctuation in the price of oil as a result of the aforesaid causes create the effect of uncertainty in the outputs of industries, not only to the manufacturing sector but also to the energy management sectors in process industries, that is oil and gas industries. According to Elder and Serletis [30] they posited that the theories of investment under uncertainty and real options predict that uncertainty about oil prices will tend to depress current investment. This uncertainty can be due to rise or fall in the oil prices.

Higher oil prices do come with a glade tidings for some industries. Apparently, they benefit oil and gas industries, but have both positive and negative multiplier effects to other components of an economy [31]. According to Hayes upstream firms face more hitches when oil prices fall since market forces is the determining factor at which oil is sold, and their costs of production are largely fixed. The higher the cost of production the higher the losses incurred by the producer. Downstream companies suffer a lesser consequences since they profit by purchasing crude oil and selling the refined products at a premium. Their earnings and profit margins always remain fairly stable even with fluctuating in oil prices. The submissions of Hayes is line with the suggestions of Jobert et al. [32] they posited that rise in the prices of oil are much desirable to the oil industries because they will make higher turnover, simultaneously, the rise in the oil prices correlate with waning outcomes for large capital expenditure projects for oil recovery. Large and capital-intensive drilling operations are hit harder in contrast to the smaller rigs, which can decide to shut down pending on when prices rise again.

Energy and the development of the shale oil is among the current drivers of US economy, new jobs opportunities has sprang up due to economy of scale (internal and external) for the Americans. Persistence, fall in oil price, could lead to folding up of operations for many onshore fracking wells that lack the working capital to continue drilling. Although the hydraulic fracturing is more expensive than typical

drilling, so shale gas companies will be among the first hit if the cost of production prevail over profits [33].

According to Adesina [34], he made references to the local key oil and gas corporation having a rough time due to the fall in oil price in the recent time with prices lower than local production in Nigeria. The local oil firms are fighting hard to survive as Crude and remains at the $20, which means Nigeria's crude is being sold at a loss, coupled with the fact that oil demand has plummeted to the lowest level in more than a generation.

While on the other side Deloitte [35] views was on the impact of the oil price collapse on company accounts, fall in oil price tends to increase risk of loss of assets. They opined that lower oil price forecasts mean lower future profits from an asset. These leads to reduction in the present value of the asset, and the asset values on balance sheets cannot be fully recovered, this results in write-off, and tendencies of knock-on effect connected to deferring taxes and holding company investment balances.

In Nigeria one of the major contributing factors for 2016 recession was fall in the price of oil coupled with decreased in quantity of production, the recession was accompanied by high inflation rate on basic commodities (cost-push) [16]. Monetary policy on inflation is always been informed by the general price level. Before the recession, the inflation rate was at a single digit of 8.0% and 9.55% per cent for 2014 and 2015 [36]. During the recession, the inflation rate was about 18.55% per cent that is in 2016 and as expected, the monetary authority introduced a tight monetary policy by raising the cost of borrowing, the interest rate was steady at 14% from July 2017 to the first quarter of 2018 against 2016 which was 200 points higher. This is against the backdrop of relative improvement in the global economy.

Saban et al. [37] Investigated the responses of monetary policy variables of select emerging markets to oil market shocks. Using conventional and Fourier Toda Yamamoto methods. In their findings, the oil prices are sensitive to structural shifts and, the causality approach with gradual/smooth shifts indicates oil price shocks influencing the currencies of Indonesia and South Africa, interest rates in Brazil and India, and inflation in South Africa and Turkey.

Also in the summaries of Santos and Chris [38], used Johansen (1992) co-integration approach and the Toda and Yamamoto [39] causality testing procedure. Applying Wald coefficient test, the nominal interest rates, and expected inflation co-move together, in the long run, there is a uni-directional causality from expected inflation to nominal interest rates as suggested by the Fisher hypothesis in the closed economy context. While in the open economy context, the result showed that the expected inflation and international variables do not contain information that predicts the nominal interest rate.

In the empirical findings of Mohammed and Jauhari [40], they employed asymmetric causality test based on Toda and Yamamoto [39] causality approach to further the causal relationship between exchange rate and inflation differentials in Brunei, Malaysia, and Singapore. The results show the existence of Granger causality running from positive cumulative exchange rate shocks to shocks in inflation differentials for Brunei and Malaysia. Also, the asymmetric causality for Singapore runs from both positive and negative cumulative domestic inflation shocks to positive and negative exchange rate shocks respectively.

Chibvalo et al. [41] in their submissions, they employed the Toda-Yamamoto approach to Granger causality to test for a causal relationship between inflation and trade openness in Zambia. They established a bi-directional causality between inflation and trade openness. Further, there exists a positive relationship between inflation and trade openness in Zambia.

3. Methodology and model specification

3.1 Methodology

This analysis aims at investigating the effect and the interrelations existing between the impact of oil price fluctuation on the monetary instrument (Exchange rate, Inflation, Interest rate). The data were sourced from the Central Bank of Nigeria (CBN), National Bureau of Statistics (NBS) and Nigeria National Petroleum Corporation (NNPC). The data cover a period of 1995–2018 and the data is monthly. All our variables are in local currency. Therefore we used oil price, the interbank exchange rate as a proxy for exchange rate data, while the prime lending rate was used as a proxy for data on the interest rate and we used consumer price index for all commodity as a proxy for inflation.

A Toda and Yamamoto model (1995) (TY-VAR) was adopted in estimating the Modified WALD Granger Non-causality test (MWALD), Forecast Error Variance Decomposition (FEVD) and Impulse Response Function (IRF).

3.1.1 Toda and Yamamoto model (1995) and the modified Wald test statistic (MWALD)

According to Salisu [42], Sims [43] and Toda and Yamamoto (TY-VAR) [39], Vector auto-regressions (VARs) are one of the widely used classes of models in applied econometrics, used as tools both for prediction and for model building and evaluation. It success lied on its flexibility and ease of application when dealing with the analysis of multivariate time series.

Practitioners have recently shown that the conventional asymptotic theory does not apply to hypothesis testing in levels VAR's if the variables are integrated or co-integrated [39, 43]. And one of the deficiencies of the VAR application is the inability to ascertain the a priori expectation of the variables whether the variables are integrated, co-integrated, or (trend) stationary. This necessitates pretesting(s) for a unit root(s) and co-integration in the economic time series, asarequisite for estimating the VAR model, and also when the intentions are prioritized towards the estimation of cointegration and vector error correction model [44].

Conversely, the powers of the unit and also simulation experiments of Johansen tests for co-integrating are very sensitive to the values of the nuisance parameters in finite samples and hence not very reliable for sample sizes that are typical for economic time series [39, 45, 46].

To alleviate these problems, Toda and Yamamoto [39] as quoted by Shakya [47], Giles [48] proposes the augmented VAR modeling, that is the modified Wald test statistic (MWALD), which is more superiority to the ordinary Granger - causality tests, the method is flexible and easy to apply, since one can test linear or nonlinear restrictions on the coefficients by estimating a levels VAR and applying the Wald criterion, paying little attention or circumventing the integration and cointegration properties of the time series data [42, 44]. However, the model is not a substitute for the conventional pre-testing in time series analysis, but as a complementary to the conventional VAR [49].

In estimating the MWALD test for Granger causality, it is prerequisite to determine the maximum possible order of the integration of the basic variables (d_{max}). Although, the variables could be a mixture of I (0), I (1), and I (2), in such condition, $d_{max} = 2$. The determination of the optimal lag length (k) is very

important, to avoid overstating or understating the true value of lag, to evade biased estimates of accepting the null hypothesis when it should be rejected, vice versa. By identifying d_{max} and k, a level VAR model of order ($k + d_{max}$) is estimated and zero restrictions test is conducted on lagged coefficients of the regressors up to lag k. This process certifies that the Wald test statistics have an asymptotical chi-square (χ^2) distribution whose critical values can be used to draw a valid inference and conclusion [39, 44].

3.2 Model specification

The model used in this research work borrowed a leave from the Toda and Yamamoto model (1995) as iterated in the work of Saban et al. [37], their model was adopted in this paper, to finding the inter-relationship between oil price and monetary variables. While they consider Granger Non-causality and structural shift, in our model we considered Granger Non-causality test, and substitute structural shift with Impulse Response Function (IRFs) and Forecast Error Variance Decomposition (FEVD). The TY-VAR is given by:

$$y_t = \alpha + \beta_1 y_{t-1} + \cdots + \beta_{k+d} y_{t-(k+d)} + \varepsilon_t \tag{1}$$

Where y_t comprises of K endogenous variables, α is a vector of intercept terms, β are coefficient matrices, and ε_t is white-noise residuals.

3.2.1 VAR modified Wald test (MWALD)

The analysis aims at establishing the interrelationship that exist among the variables; i.e. oil price (lnoilpr), and monetary policy variable i.e. exchange rate (lnexchr), interest rates (lnintr), and inflation (lncpi). The specification considers each variable expressed as independent in the model as a function of its lag and the lag of other variables in the model. Here the exogenous error terms ε_{1t}, ε_{2t}, ε_{3t}, ε_{4t}, are independent and are interpreted as structural innovations. The realization of each structural innovation is known as capturing unexpected shocks to its dependent variable (respectively), which are uncorrelated with the other unexpected shocks (ε_t). Equations for the Modified Warld Test model are presented as follows;

$$\begin{aligned}\text{lnoilpr} = \alpha_1 &+ \sum_{i=1}^{k+dm} \beta_{1i}\text{lnoilpr}_{t-1} + \sum_{i=1}^{k+dm} \gamma_{1i}\text{lnexchr}_{t-1} + \sum_{i=1}^{k+dm} \delta_{1i}\text{lnicp}_{t-1} \\ &+ \sum_{i=1}^{k+dm} \theta_{1i}\text{lnintr}_{t-1} + \varepsilon_{1t}\end{aligned} \tag{2}$$

$$\begin{aligned}\text{lnexchr} = \alpha_2 &+ \sum_{i=1}^{k+dm} \beta_{2i}\text{lnexchr}_{t-1} + \sum_{i=1}^{k+dm} \gamma_{2i}\text{lnoilpr}_{t-1} + \sum_{i=1}^{k+dm} \delta_{2i}\text{lnicp}_{t-1} \\ &+ \sum_{i=1}^{k+dm} \theta_{2i}\text{lnintr}_{t-1} + \varepsilon_{2t}\end{aligned} \tag{3}$$

$$\begin{aligned}\text{lncpi} = \alpha_3 &+ \sum_{i=1}^{k+dm} \beta_{3i}\text{lncpi}_{t-1} + \sum_{i=1}^{k+dm} \gamma_{3i}\text{lnoilpr}_{t-1} + \sum_{i=1}^{k+dm} \delta_{3i}\text{lnexchr}_{t-1} \\ &+ \sum_{i=1}^{k+dm} \theta_{3i}\text{lnintr}_{t-1} + \varepsilon_{3t}\end{aligned} \tag{4}$$

$$\text{lnintr} = \alpha_4 + \sum_{i=1}^{k+dm} \beta_{4i}\text{lnintr}_{t-1} + \sum_{i=1}^{k+dm} \gamma_{4i}\text{lnoilpr}_{t-1} + \sum_{i=1}^{k+dm} \delta_{4i}\text{lnexchr}_{t-1} + \sum_{i=1}^{k+dm} \theta_{4i}\text{lncpi}_{t-1} + \varepsilon_{1t} \quad (5)$$

Where lnoilpr, *lnexchr*, *lncpi*, *lnintr* are the log of oil price, exchange rate, inflation rate and interest rate, while $lnoilpr_{t-1}$, $lnexchr_{t-1}$, $lncpi_{t-1}$ and $lnintr_{t-1}$ are the lag variables of oil price, exchange rate, inflation rate and interest rate in logs.

4. Empirical results and analysis

4.1 Stationarity tests

Although, the Todo-Yamamoto model, the MWALD test was introduced for ease of estimation by circumventing the presence of unit roots pre-testing problem, nevertheless, there is the need to determine the maximum order of integration of the variables, which is necessary for estimation of The MWALD test for Granger causality by Toda and Yamamoto [39]. Therefore, we ran the test for the Augmented Dickey-Fuller (ADF) test, Phillips – Perron (PP) test and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) unit root test, to ascertain the stationarity of the variables [45, 50–54].

From **Tables 1** and **2**, the unit-roots tests confirmed all our process to be considered integrated at the first difference and 1% level of significance using Augmented Dickey-Fuller (ADF) test and Phillips – Perron (PP).

While Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) in **Table 3** is in contrast to ADF and PP which indicated that the variables are at levels. This corroborates with the work of Yakubu and Abdul Jalil in their test of stationarity. A quick check on the line graphs in **Figure 1** indicated that all the variables are at first difference I (1). Therefore, we stick to ADF and PP, and agree that $d_{max} = 1$.

4.2 Modified Wald (MWALD) test for Granger causality

The Modified Wald (MWALD) Test for Granger Causality requires the determination of optimal lag which is presented in **Table 4**. By default, we use LR: sequentially modified LR test statistic, FPE: Final prediction error, AIC; Akaike

Variable	ADF							
	Level				First Difference			
	Constant	Prob.	Constant & Trend	Prob.	Constant	Prob.	Constant & Trend	Prob.
lnoilpr	−1.2206	0.6663	−2.3779	0.3904	−14.3220***	0.0000	−14.3037***	0.0000
lnexchr	0.3070	0.9784	−1.5899	0.7949	−11.6443***	0.0000	−11.6786***	0.0000
lncpi	−1.4401	0.5626	−5.3282***	0.0000	−13.3181***	0.0000	−13.3666***	0.0000
lnintr	−1.8216	0.3696	−2.3214	0.4250	−16.2688***	0.0000	−16.2400***	0.0000

*Note: ***, ** and * denote significance at 1%, 5% and 10% respectively. ADF test the null hypothesis of 'not stationary' against the alternative of 'stationary'. Source: E-views Version 9 software was used in the estimation.*

Table 1.
ADF stationarity tests.

Variable	PP							
	Level				First Difference			
	Constant	Prob.	Constant & Trend	Prob.	Constant	Prob.	Constant & Trend	Prob.
lnoilpr	−1.2921	*0.6340*	−2.3897	*0.3841*	−14.3491***	*0.0000*	−14.3312***	*0.0000*
lnexchr	1.0660	*0.9972*	−1.5040	*0.8271*	−9.8974***	0.0000	−9.8872***	0.0000
lncpi	−1.7664	0.3968	−5.5627***	*0.0000*	−13.2950***	0.0000	−13.3455***	0.0000
lnintr	−1.9316	*0.3175*	−2.4972	*0.3294*	−16.2641***	0.0000	−16.2351***	0.0000

*Note: Just like the ADF, the PP unit root test has the null hypothesis of 'not stationary' against the alternative, which is 'stationary'. *, ** and *** indicate the level of significance at 10%, 5% and 1% respectively. Source: E-views Version 9 software was used in the estimation.*

Table 2.
PP stationarity tests.

Variable	KPSS							
	Level				First Difference			
	Constant	Prob.	Constant & Trend	Prob.	Constant	Prob.	Constant & Trend	Prob.
lnoilpr	1.8432***		0.2905***		0.0615		0.0359	
lnexchr	1.7493***		0.2035**		0.1959		0.0771	
lncpi	0.2299***		0.1406*		0.2440		0.1035	
lntr	0.9826***		0.1353*		0.0457		0.0454	

*Note: In contrast to ADF and PP, KPSS unit root test has the null hypothesis of 'stationarity' against the alternative, 'not stationary'. ***, ** and * represent 1%, 5% and 10% level of significance respectively. Source: E-views Version 9 software was used in the estimation.*

Table 3.
KPSS stationarity tests.

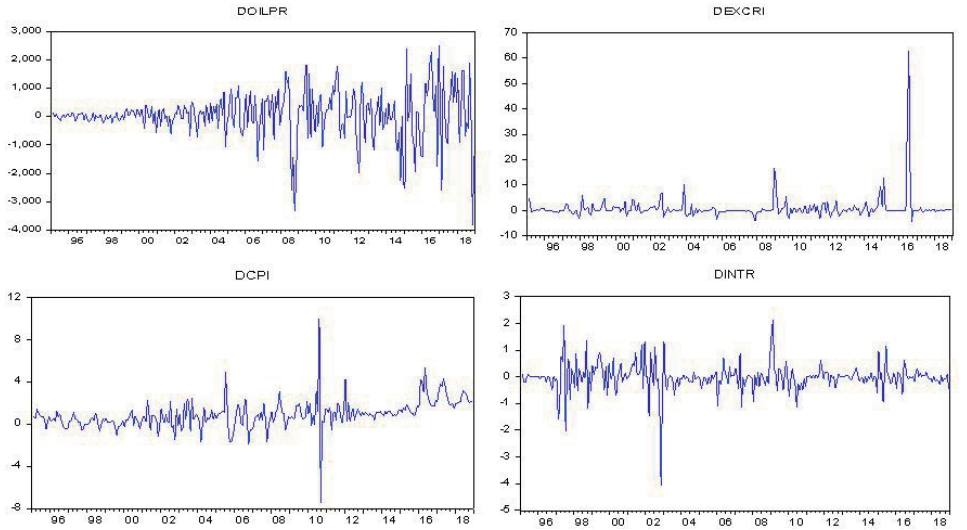

Figure 1.
Graphical representation of original series at I(1) for oil price (doilpr), exchange rate (dexcri), CPI (dcpi) and interest rate (dintr).

information criterion, SBC: Schwarz information criterion and Hannan-Quinn information criterion to determine the optimal lag for the estimation of VAR system. The SC and HQ minimize its value at lag 2 while LR and FPE minimizes at lag 3. According to Liew [55], Asghar and Abid [56] Estimating the lag length of the autoregressive process for a time series is imperative in econometrics. The selection is done to minimize the chance of underestimation while at the same time maximizing the chance of recovering the true lag length. Another important aspect of the lag selection criteria is to overcome the structural break. Though, studies indicated that HQC is found to surpass the rest by correctly identifying the true lag length. In contrast, AIC and FPE are better choices for a smaller sample. In **Table 4** out of the two criteria, we propose three lags (lag 3) as the optimal lag.

4.3 Correlation matrix for TY-VAR

The orthogonal impulse response are based on recursive causal ordering, if the ordering is reversed different sets of structural shocks will be identified, and this gives a different impulse response function (IRF) and forecast error variance decomposition (FEVD), except if the error terms contemporaneous correlations are low [57]. According to Lutkepohl [58] given a sample size of T, the determinant of the reordering of the variables is given by $\pm 1.96\sqrt{T}$.

The ordering of variables suggested by Sims (1981, 1980) as iterated in the work of Yakubu and Abdul Jalil [44], Duasa [46], is to start with the most exogenous variables in the system and ended by the most endogenous variable. **Table 5** shows the residual correlation matrix result, the result shows that there is no instantaneous correlation between the variables because the variables are not significantly different from zero (at a 5% level of significance) [59]. This is based on the sample size in this analysis, we need at least a correlation of 31% that is above 5% level of significance to satisfy the call for reordering of the variables. Since there is no strong correlation among the variable we assumed the arrangement of our variables are in order.

4.4 VAR residual serial correlation LM tests

Before the estimation of the Causality Test, Forecast Error Variance Decomposition (FEVD) and Impulse Response Functions (IRFs). The VAR residual serial correlation test is needed to verify the adequacy of the lag selection criterion used in

Endogenous variables: LNOILPR LNEXCHR LNCPI LNINTR						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	1024.270	NA	8.68e-09	−7.210389	−7.158863	−7.189729
1	3293.435	4458.148	1.05e-15	−23.13382	−22.87619	−23.03052
2	3342.568	95.13951	8.35e-16	−23.36797	−22.90424*	−23.18203*
3	3364.257	41.38540*	8.02e-16*	−23.40817*	−22.73834	−23.13959
4	3375.620	21.36093	8.29e-16	−23.37540	−22.49947	−23.02418
5	3381.763	11.37514	8.89e-16	−23.30575	−22.22371	−22.87189

**indicates lag order selected by the criterion. LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion and HQ: Hannan-Quinn information criterion. Source: E-views Version 9 software was used in the estimation.*

Table 4.
VAR lag order selection criteria.

	LNOILPR	LNEXCHR	LNCPI	LNINTR
LNOILPR	1.000000			
LNEXCHR	0.156275	1.000000		
LNCPI	0.025236	0.038583	1.000000	
LNINTR	0.052056	0.144681	−0.057944	1.000000

Source: *Estimation was compiled using E-views Version 9 software.*

Table 5.
Correlation matrix for TY-VAR.

Lags	LM-Stat	Prob
1	13.85744	0.6093
2	8.875657	0.9184
3	15.67327	0.4760
4	12.71378	0.6936

Probs from chi-square with 16 df.
Source: *Estimation was compiled using E-views Version 9 software.*

Table 6.
TY-VAR residual serial correlation LM tests.

the estimation of a chosen multivariate model, it is applied to test a set of restrictions on a model that is unrestricted, and it is based on the restricted maximum likelihood test (ML) [42, 60, 61]. From the TY-VAR estimated output for the residual serial correlation test in **Table 6**, the null hypothesis for the test is that there is no serial correlation. The result submits that there is no evidence of serial correlation. Which indicate the acceptance of the null hypothesis that the restriction (lags) place on the model is adequate.

4.5 Test for normality of TY-VAR residuals

In the test for normality, to examine whether the residuals are normally distributed. We employed the null hypothesis H_0: residuals are normally distributed. From **Table 7** we rejected the null hypothesis of normality of residuals of each equation as well as all the equations combined at 5% level of significance since p-value of all the variables are zero. Hence, we concluded that residuals are not normally distributed [62].

Component	Jarque-Bera	df	Prob.
1	15.36714	2	0.0005
2	4572.449	2	0.0000
3	389.0131	2	0.0000
4	382.0722	2	0.0000
Joint	5358.902	8	0.0000

df and Prob stands for the degree of freedom and probability.* ***Source:* *Estimation was compiled using E-views Version 9 software.*

Table 7.
Jarque-Bera normality test result.

Although, the credibility of Iarque-Bera test of normality with application to VAR has been questioned specifically for an I(1). Jarque-Bera normality of the series does not guarantee normality of distributions, it only signifies normality of the first four moments of a distributions [58]. According to Lutz and Ufuk [63] in their remarks, they posited that Jarque-Bera test based on asymptotic critical values can be very unreliable. In their submissions, they gave the asymptotic critical values of 1–100% in their Monte Carlo analysis of VAR. They presented that the size distortions of the asymptotic test persevere even for sample sizes as large as 5000 observations.

4.6 Modified Wald test for Granger causality test (M(WALD))

From **Table 8** we have the lnoilpr as the dependent variable, at 5% level of significance, we accept the null hypothesis that there is no causality between, the lnexchr, lncpi and lnintr on the dependent variable. Also, the combination of all the independent variables do not granger caused changes in the dependent variable. This indicates the exogeneity of oil price which is been determined by many factors that are exogenous to both net importers and exporters of oil, Nigerian inclusive. According to Humbatova and Hajiyev [24] posited that the determinants of oil price range from financial factors, lack of production capacities in oil production, the decline in the world oil reserves, natural disasters, political events and processes, and no one country has the monopoly of determining oil price.

From **Table 9** we have the lnexchr as the dependent variable, at 10% level of significance, we reject the null hypothesis that there is no causality between loilpr and lnexchr. The exchange rate plays a significant role in determining the oil price both to net exporters and net importers. Specifically, oil is priced in U.S. dollars. According to Farley [64] submissions, each decrease and increase in the dollar or the price of the commodity (oil) generates an instantaneous realignment between

Excluded	Chi-sq	df	Prob.
LNEXCHR	0.297326	3	0.9605
LNCPI	2.517571	3	0.4721
LNINTR	2.072927	3	0.5574
All	5.503884	9	0.7884

Source: *Estimation was compiled using E-views Version 9 software. Note: significance at 10% and 5% levels of significance respectively.*

Table 8.
Granger causality test WALD test for Eq. (2) for the dependent variable: LNOILPR.

Excluded	Chi-sq	df	Prob.
LNOILPR	6.426225*	3	0.0926
LNCPI	2.889761	3	0.4089
LNINTR	1.567570	3	0.6668
All	11.29767	9	0.2559

Source: *Estimation was compiled using E-views Version 9 software. Note: significance at 10% and 5% levels of significance respectively.*

Table 9.
Granger causality test WALD test for Eq. (3) for the dependent variable: LNEXCHR.

the US dollar and other currencies. These correlated is more significant in countries with significant oil reserves that depend largely on crude exports and they experience more economic damage than those with more diverse resources. In the presentations of Bützer [65], he established that oil Net exporters tend to respond against depreciation pressures by running down foreign exchange reserves, particularly after oil demand shocks, but also global demand shocks (which also decrease oil prices). This is sometimes supplemented by a nominal depreciation of exchange rates. These invariably indicate that oil demand shocks are a relevant factor for their exchange rates. While we accept the null hypothesis that there is no causality between, the lncpi and lnintr on the dependent variable. Also, the combination of all the independent variables do not Granger cause changes in the dependent variable.

Also from **Table 10** we have the lncpi as the dependent variable, at 10% level of significance, we reject the null hypothesis and accept the alternative hypothesis that there is causality from lnexchr and linintr to lncpi. Exchange rate plays a vital role in determining prices in Nigeria, as an economy that has some element of a Dutch disease syndrome, and relied heavily on importation of basic necessity, when we factor out oil exportation from the total export, the non-oil balance of trade approximately stood at negative 7114 billion for 2017 as stated in our introduction. Therefore, appreciation in the exchange rate can cause inflation (lncpi) (Katz, 1973). The interest rate is one of the instruments used by the monetary authority to regulate the economy either during inflation or deflationary periods, the interest rate affects the demand and allocation of the available loanable funds the level, and pattern of consumption and investment ([66] p. 15). Before 2016 recession in Nigeria, the inflation rate was at a single digit of 9.55% in 2015, during the recession, the inflation rate was at double-digit 18.55% in 2016 and the central bank introduced a tight monetary policy, by raising the interest rate steady at 14 per cent from July 2017 to the first quarter of 2018 against 2016 which is 200 points higher [36].

Also, the combination of all the independent variables (lnoilpr, lnexchr and lnintr) does Granger cause changes in the dependent variable lncpi at 5%, but lnexchr and lnintr are more pronounced in the causality. While we accept the null hypothesis that lnoilpr do not granger cause lncpi.

In **Table 11** we have lnintr as the dependent variable, we reject the null hypothesis and accept the alternative hypothesis that at 5% levels of significance that there is a causality which is from lnoilpr and lnexchr to the endogenous variable lnintr, while there is no any causality with the log of lncpi on the dependent variable. Also, the combination of all the independent variables Granger cause changes in the dependent variable at a 5% level of significance. The relationship of lnoilpr and lnintr may not be exclusive but via the exchange rate, in the boom period the net exporter of oil has more dollars to expend, vice versa during deflationary periods, both periods has a direct link to economic growth. To avoid these inflationary or

Excluded	Chi-sq	df	Prob.
LNOILPR	1.151935	3	0.7646
LNEXCR	6.824049*	3	0.0777
LNINTR	7.771454*	3	0.0510
All	14.75625**	9	0.0979

Source: *Estimation was compiled using E-views Version 9 software. Note: * and ** show significance at 10% and 5% levels of significance.*

Table 10.
Granger causality test WALD test for Eq. (4) for the dependent variable: LNCPI.

Excluded	Chi-sq	df	Prob.
LNOILPR	14.66233**	3	0.0021
LNEXCR	10.44319**	3	0.0152
LNCPI	3.488718	3	0.3222
All	31.49615**	9	0.0002

Source: *Estimation was compiled using E-views Version 9 software. * and ** show significance at 10%, 5% and 1% levels of significance.*

Table 11.
Granger causality test WALD test for Eq. (5) for dependent variable: LNINTR.

deflationary tendencies, the central bank may engage in the sterilization process through open market operation, by manipulating the short-term interest rate, that is by increasing interest rates to discourage borrowing during inflationary periods or decrease the interest rate to encourage borrowing during deflationary periods. The relation is said to be inverse and this shows how oil price and exchange rate influences the monetary policy of net oil exporters.

4.7 Forecast error variance decomposition (FEVD) and impulse response functions (IRFs)

From the estimated TY-VAR, we compute forecast error variance decompositions (FEVD and impulse response functions (IRF), which serve as means for evaluating the dynamics of the interrelationship, interactions, and strength of causal relations among the variables in the system. The impulse response functions trace the effects of a shock to one endogenous variable on to the other variables in the VAR, variance decomposition separates the variation in an endogenous variable into the component shocks to the VAR [10, 46].

In simulating FEVD and IFRs, the VAR innovations can be contemporaneously correlated. That is a shock in one variable can work through the contemporaneous correlation with innovations in other variables. The responses of a variable to innovations in another variable of interest cannot be adequately represented in isolation, due to the facts that shock to individual variables cannot be separately identified due to contemporaneous correlation [46].

In our analyses, we applied Cholesky approach which uses the inverse of the Cholesky factor of the residual covariance matrix to orthogonalise impulses (innovations) as recommended by Sims (1980) as quoted by Duasa [46] and (Breitung, Bruggemann, and [58]) to solve this identification problem. The strategy requires a pre-specified causal ordering of the variables, which we estimated in **Table 5** for the correlation matrix. The results of FEVD are displayed in **Tables 12–15**, while the IRFs represented in **Figures 2–17** in appendix 1, respectively.

4.7.1 Forecast error variance decomposition (FEVD)

We explored the Cholesky factorization in the E-Views software and forecast the interrelationship of the variables up 48 months equal to 4 years. **Table 10** is the Table for FEVD for lnoilpr as a dependent variable for 48 periods (4 years) forecast. In forecasting a variable, shocks in the residual of the forecasted variable contribute more to its variance than the shocks in other variables in the first period. The shocks in oil price-output contributed more to its variance, from 100% in the first period down to 70.58% in the 48 period (4th year) of the forecast period. This is followed

Period	S.E.	LNOILPR	LNEXCHR	LNCPI	LNINTR
1	0.039283	100.0000	0.000000	0.000000	0.000000
2	0.059667	99.56602	0.007555	0.357862	0.068566
3	0.074387	99.31622	0.077847	0.518729	0.087200
4	0.087239	99.17720	0.135794	0.615055	0.071949
5	0.099720	99.16728	0.123200	0.650960	0.058563
6	0.112282	99.16645	0.102858	0.650544	0.080151
12	0.191020	98.36406	0.104402	0.630791	0.900743
18	0.276129	96.71609	0.060657	0.908562	2.314688
24	0.366613	94.33976	0.064427	1.477383	4.118426
30	0.457642	91.03687	0.223173	2.331971	6.407984
36	0.541764	86.40256	0.693518	3.520289	9.383636
42	0.611323	79.78047	1.802594	5.120937	13.29600
43	0.621214	78.43050	2.090483	5.429983	14.04904
44	0.630655	77.00398	2.418306	5.749531	14.82819
45	0.639696	75.50135	2.790808	6.077919	15.62992
46	0.648412	73.92544	3.212962	6.412711	16.44889
47	0.656906	72.28230	3.689787	6.750497	17.27741
48	0.665310	70.58226	4.226078	7.086683	18.10498

Note: SE refers to the total variance error in forecasting LNOILPR. Other columns represent the percentage of the variance attributable to shocks in the residual of the respective variables. Sources: *Compiled using Eviews version 9.*

Table 12.
Variance decomposition of LNOILPR.

by lnintr that contributed 4.11% in the 24th period to about 18.11% in the 48 period (4th year). This followed by lncpi that contributed 1.48% at the 24th period to 7.09 at the 48 periods and last is the lnexchr contributions from 0.06% in the 24th period to 4.22% in the 48 periods. This shows monetary policy influences the fluctuation inherent with the oil price and in the future, it shows that lnintr will respond highly to oil price shocks. While the contemporaneous relationship between the oil prices as the endogenous variables (lncpi and lnexchr) in our model are very insignificant. This is an indication that it will take a longer time into the future, for variables other than lnintr to influence the impact of oil prices.

Table 13, is the Variance Decomposition for dependent variable lnexchr, the contributions to itself were 97.56% in the 1st period, to about 57.82% in the 48 period (4th year) into the future. This followed by the contributions of lnoilpr with 28.28% at the 24th period and 39.31% at the 48th period. While lncpi and lnintr contributed 2.58% and 0.02% all at the 48th period. The error variance in forecasting lnexchr from lnoilpr is high, which indicates that shocks in the residuals of lnoilpr will have much effect in determining the lnexchr in the future.

Table 14 is forecast error variance decomposition of LNCPI as the predictant, the predictant contributes 99.81%, 54.73%, 3.18% in the 1st, 12th and 48th periods to itself, which indicates that the contributions of lncpi to itself declined in 4 years. While lnexchr contributes more to the error variance in forecasting lncpi, contributing about 43.40% up to 82.74% for the periods 12th and 36th then declined to 71.74%in the 48th period (4th year). While lnoilpr contributions started from 24th period with 2.47% and keep increasing up to 25.02% in the 48th period. Whereas

Variance Decomposition of LNEXCHR:					
Period	**S.E.**	**LNOILPR**	**LNEXCHR**	**LNCPI**	**LNINTR**
1	0.008667	2.442191	97.55781	0.000000	0.000000
2	0.016018	1.303029	98.47056	0.226099	0.000307
3	0.020768	0.793908	98.43015	0.646775	0.129165
4	0.024011	0.693289	97.87271	1.034284	0.399717
5	0.026961	0.553215	97.54321	1.309243	0.594331
6	0.030343	0.647208	97.17916	1.485892	0.687736
12	0.059365	4.366737	92.68622	2.025025	0.922015
18	0.109801	12.31598	84.79549	2.160683	0.727839
24	0.199812	21.01359	76.31208	2.242682	0.431654
30	0.358345	28.27847	69.15410	2.361025	0.206413
36	0.633138	33.57260	63.83346	2.514318	0.079625
42	1.103690	37.11351	60.17595	2.683471	0.027067
43	1.209424	37.56150	59.70328	2.711909	0.023305
44	1.324903	37.97407	59.26509	2.740223	0.020615
45	1.451006	38.35307	58.85970	2.768351	0.018878
46	1.588692	38.70034	58.48544	2.796232	0.017984
47	1.739007	39.01764	58.14072	2.823810	0.017829
48	1.903092	39.30669	57.82396	2.851035	0.018316

Note: SE refers to the total variance error in forecasting LNEXCHR. Other columns represent the percentage of the variance attributable to shocks in the residual of the respective variables. ***Source:*** *Estimation was compiled using E-views Version 9 software.*

Table 13.
Variance decomposition of LNEXCHR.

lnintr contributions are insignificant. This has brought a clearer picture that lnexchr and lnoilpr are the major determinant of inflation in the economy.

Table 15 illustrated the forecast error variance decomposition of lnintr, contributing to its future error variation of 97.41%, 42.01% and 54.34% for the 1st, 12th and declined to 3.70% at the 48th period (4th year), this is followed by lnexchr which contributes 1.91%, 10.19% for the 1st and 6th periods, it declined for some periods and pick up again and continue rising to 82.81% in the 48th period (4th year).

This is trailed behind by lnoilpr, contributing 4.32% and 43.37% in the 6th and 12th, 75.25% at 24th period and started declining up to 12.41% at the 48th period (4th year). This indicates also a strong relationship into the future. The forecast error variance decomposition of the variables estimates also coincides with the result we obtained in the estimates we derived in **Table 11**, which also indicates that our estimates are good to go with for future implementation of policies.

4.7.2 Response functions (IRFs)

In **Figure 2**, from appendix 1, the Oil price (lnoilp) responded contemporaneously by the change in its own shocks, which is positive and not dissipating. The implication is that hick in the price of oil may mean high revenue, but the

Variance Decomposition of LNCPI:					
Period	**S.E.**	**LNOILPR**	**LNEXCHR**	**LNCPI**	**LNINTR**
1	0.006843	0.063687	0.122994	99.81332	0.000000
2	0.010614	0.111687	1.169617	97.78015	0.938541
3	0.013902	0.104867	1.709240	96.72400	1.461890
4	0.016436	0.118843	2.348794	96.05369	1.478675
5	0.018494	0.094052	3.766938	94.89832	1.240691
6	0.020348	0.110542	6.716716	92.14406	1.028684
12	0.034150	0.390382	43.39555	54.73213	1.481945
18	0.058790	0.800621	71.63000	26.51978	1.049596
24	0.102887	2.477121	83.86813	13.27275	0.382003
30	0.182422	6.425699	86.02039	7.403793	0.150115
36	0.326127	12.33701	82.73589	4.811637	0.115460
42	0.583692	18.92647	77.30909	3.668364	0.096074
43	0.642926	19.99991	76.35470	3.554354	0.091028
44	0.708053	21.05415	75.40480	3.455500	0.085552
45	0.779631	22.08580	74.46447	3.369987	0.079739
46	0.858270	23.09198	73.53809	3.296234	0.073694
47	0.944635	24.07026	72.62936	3.232858	0.067521
48	1.039451	25.01867	71.74135	3.178651	0.061323

Note: SE refers to the total variance error in forecasting LNCPI. Other columns represent the percentage of the variance attributable to shocks in the residual of the respective variables. ***Source:*** *Estimation was compiled using E-views Version 9 software.*

Table 14.
Variance decomposition of LNCPI.

consequences is, as an import based economic of non-oil goods and refined petroleum product, with domestic regulation of prices (subsidies), the policy will confine government's ability to finance the import bills as well as meet other international obligations [8]. While the response of oil price (lnoilpr) to change in Exchange rate (lnexchr) is insignificant in **Figure 3**. Inflation (lncpi), and Interest rate (lnintr) in **Figures 4**, and **5** showed some level of positive response.

In **Figure 6**, there is a slightly positive response of Exchange (lnexchr) to change Oil price (lnoilpr) in the sixth lag period. This show how influential oil is in determining exchange rate, since high price of oil means more revenue (foreign income), also Exchange (lnexchr) responded instantaneously, a positive response, to change in its self (**Figure 7**.). In **Figure 8**, there is slight positive response of lnexchr to change in lncpi and **Figure 9** showed a small inverse response of lnexchr to change in lnintr.

In **Figures 10** and **13**, Inflation (lncpi) did not show a meaningful response to orthogonal change in the price of oil (lnoilpr) and Interest rate (lnintr). While **Figure 11**, showed a positive response in Inflation (lncpi) to change in the Exchange rate (lnexchr), that is from the second lag period up to the tenth lag period in increasing order, this indicate that inflation will continue since the response is not dissipating unless there is a policy to induce deflation. Whereas in **Figure 12** there is an instantaneous response of Inflation (lncpi) to change in Inflation (lncpi) in a

Variance Decomposition of LNINTR:					
Period	**S.E.**	**LNOILPR**	**LNEXCHR**	**LNCPI**	**LNINTR**
1	0.011298	0.270981	1.911153	0.411721	97.40614
2	0.015682	1.162856	3.384292	0.236829	95.21602
3	0.019164	0.778732	7.551086	0.251113	91.41907
4	0.021868	1.545252	10.35243	0.690563	87.41175
5	0.024147	4.317860	10.80310	1.548061	83.33098
6	0.026278	8.517769	10.19189	2.639437	78.65090
12	0.042469	43.36535	7.083532	7.537991	42.01312
18	0.068739	68.22092	7.817425	6.432329	17.52932
24	0.105922	75.25005	13.09986	4.196117	7.453977
30	0.154692	69.22610	23.97069	2.633864	4.169344
36	0.219876	52.16768	42.34294	1.710601	3.778773
42	0.320347	28.71560	65.93762	1.220443	4.126342
43	0.343392	25.06914	69.62387	1.173901	4.133092
44	0.369026	21.71282	73.04019	1.136972	4.110024
45	0.397622	18.71892	76.11686	1.109481	4.054735
46	0.429590	16.14604	78.79614	1.091170	3.966652
47	0.465375	14.03524	81.03610	1.081687	3.846977
48	0.505456	12.40799	82.81296	1.080569	3.698485

Cholesky Ordering: LNOILPR LNEXCHR LNCPI LNINTR. Note: SE refers to the total variance error in forecasting LNINTR. Other columns represent the percentage of the variance attributable to shocks in the residual of the respective variables. ***Source:*** *Estimation was compiled using E-views Version 9 software.*

Table 15.
Variance decomposition of LNINTR.

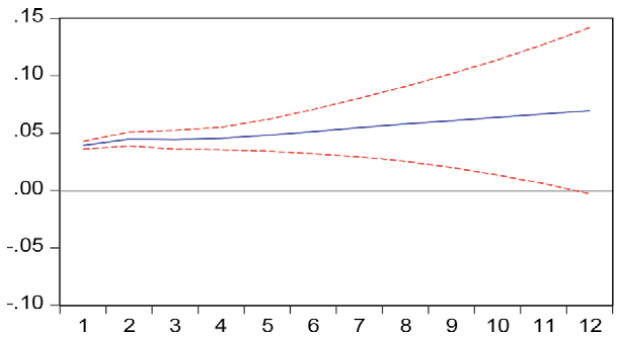

Figure 2.
Impulse response function of lnoilpr to lnoilpr.

high positive level, with a slight drop towards the tenth period which indicates tendencies of achieving normality in the future.

Figure 14, showed that there is an inverse response of Interest rate (lnintr) to one standard deviation change in the price of oil (lnoilpr) from the second lag period in an increasing order up to the tenth period, this is expected because the assumption is that interest rate has an inverse relationship with the oil price. Also

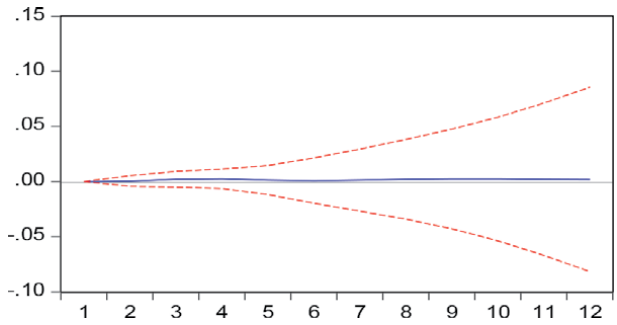

Figure 3.
Impulse response function of lnoilpr to lnexchr.

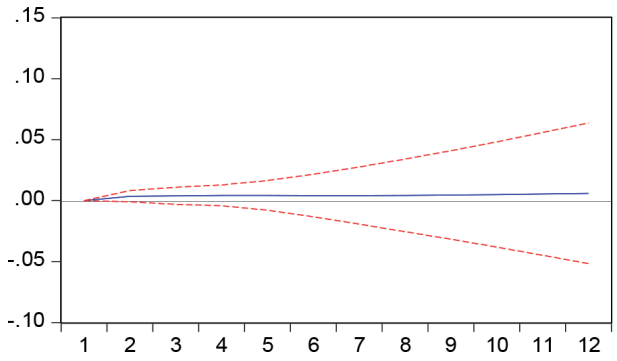

Figure 4.
Impulse response function of lnoilpr to lncpi.

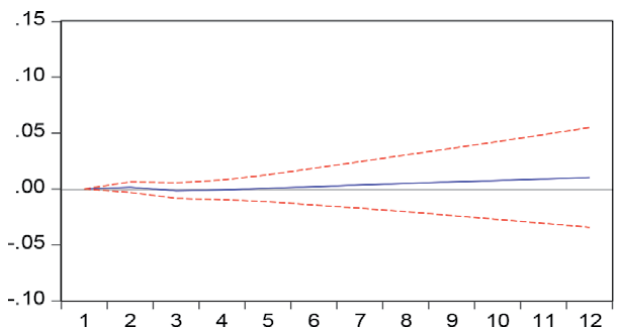

Figure 5.
Impulse response function of lnoilpr to lnintr.

Figure 15 indicated an instantaneous positive response of interest rate (lnintr) to change in the Exchange rate (lnexchr), in the third and fourth period, before it dying off which indicates that there is propensities of achieving normality in the long run. In **Figure 16** Interest rate (lnintr) responds contemporaneously to change in Inflation (lncpi), with a positive increase from the fourth period and finally, in **Figure 17** Inflation (lncpi) responded significantly to change Inflation (lncpi). The impulse response functions further complement the Forecast Error Variance Decomposition by given a portrait of the direction of the inter-relationships of variables.

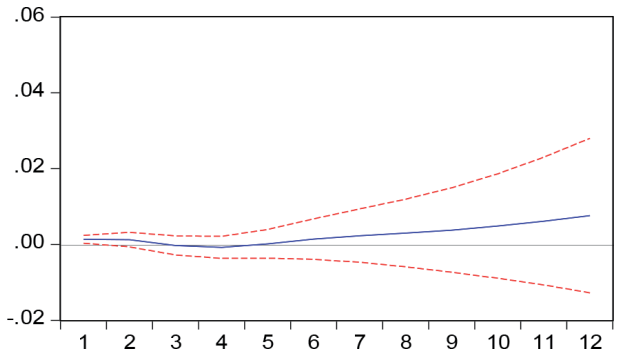

Figure 6.
Impulse response function of lnexchr to lnoilpr.

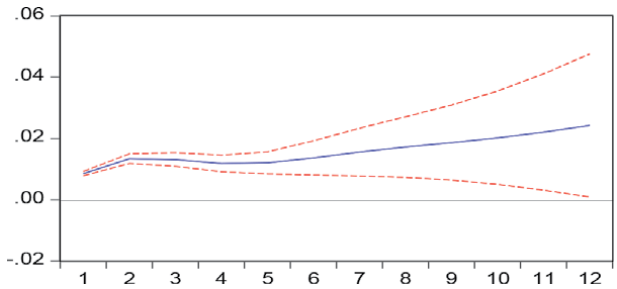

Figure 7.
Impulse response function of lnexchr to lnexchr.

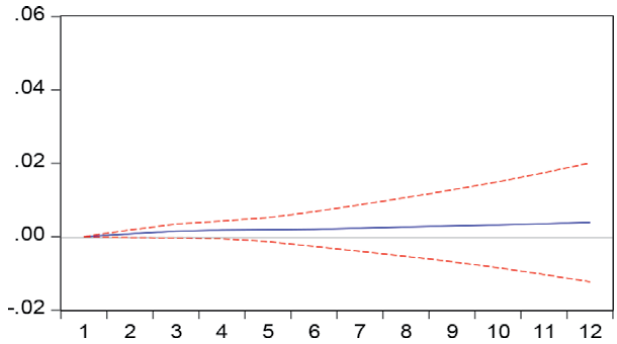

Figure 8.
Impulse response function of lnexchr to lncpi.

5. Conclusion and recommendation

In this research work, we explored the Toda-Yamamoto Modified Wald Test (MWALD) to examine the impact of oil price fluctuation on the monetary instrument in Nigeria, by looking at their causal relationships. The study covered the period 1995 to 2018 and the data are monthly data, to establish the contemporaneous relationships between these macroeconomic indicators. Among other analyses are the Granger Causality, FEVD and IRFs.

The review showed the direction of causality and FEVD into the future for 48 months equivalent to four years (short-run), between oil price, Exchange rate, Inflation, and Interest rate.

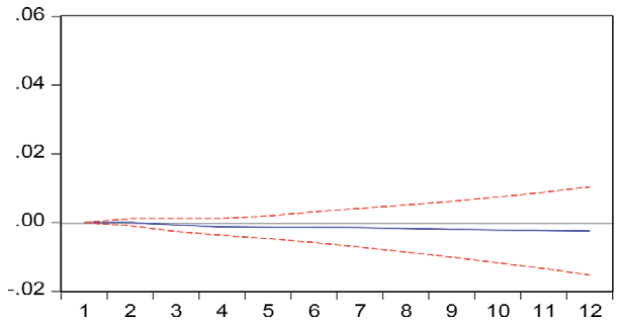

Figure 9.
Impulse response function of lnexchr to lnintr.

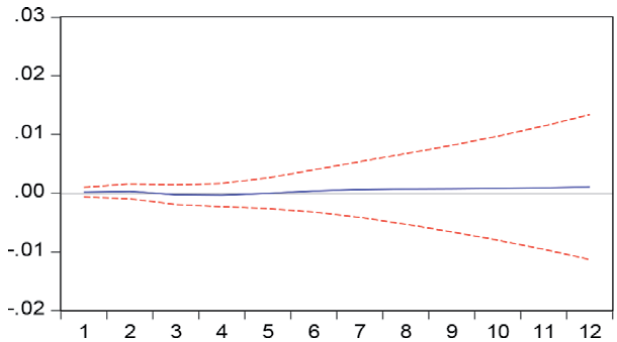

Figure 10.
Impulse response function of lncpi to lnoilpr.

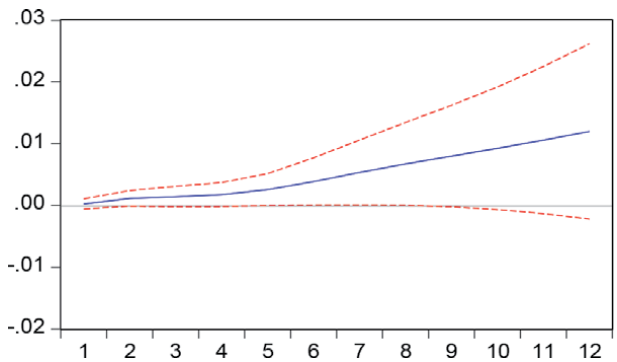

Figure 11.
Impulse response function of lncpi to lnexchr.

From the analyses of Toda-Yamamoto Granger Causality WALD Test, the review presented that there is unidirectional causality from lnoilpr to lnexchr in **Table 9**. This is consistence with the result we obtained in the estimation forecast error variance decomposition of lnexchr (**Table 13**) as the predictant, where the predictant contributes 97.56% in the 1st period, to about 57.82% in the 48 period (4th year) into the future. This was followed by the contributions of lnoilpr with 28.28% at the 24th period and 39.31% at the 48th period. While lncpi and lnintr contributed 2.58% and 0.02% all at the 48th period. This was also complemented by for IRFs in **Figure 7** in the appendix.

Also from granger causality of lncpi as a dependent variable in **Table 10** there is unidirectional causality from lnexchr and lnintr to lncpi, also the combination of all

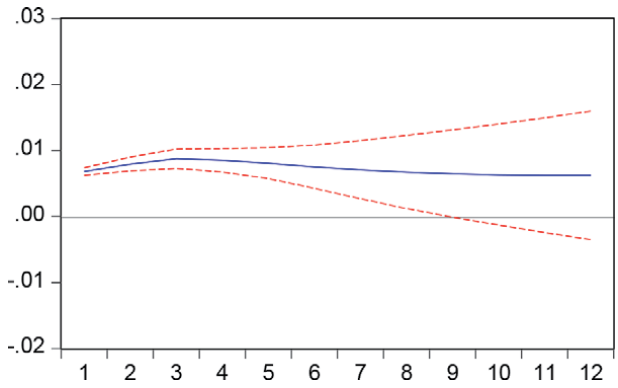

Figure 12.
Impulse response function of lncpi to lncpi.

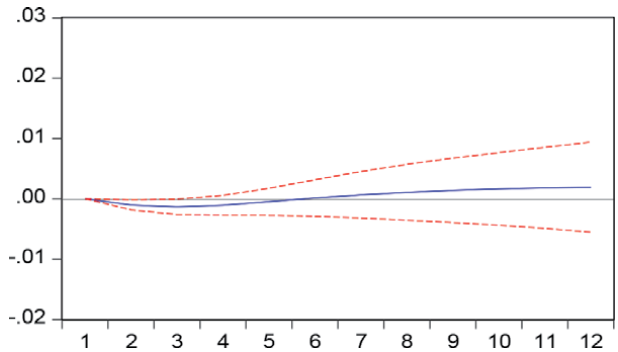

Figure 13.
Impulse response function of lncpi to lnintr.

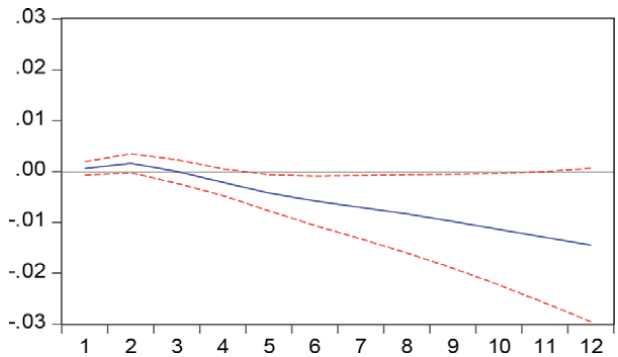

Figure 14.
Impulse response function of lnintr to lnoilpr.

the three independent variables (lnoilpr, lnexchr and lnintr) granger cause lncpi but lnexchr and lnintr have more contributions. This is also in tandem with the result of FEVD for dependent variable lncpi in **Table 14** where the dependent variable contributions to itself were 99.81%, 54.73%, 3.18% in the 1st, 12th and 48th periods, which indicates that the contributions of lncpi to itself declined in 4 years. While lnexchr contributes more to the error variance in forecasting lncpi, contributing about 43.40% up to 82.74% for the periods 12th and 36th periods (3rd years) then declined to 71.74%in the 48th period (4th year). While lnoilpr contributions started

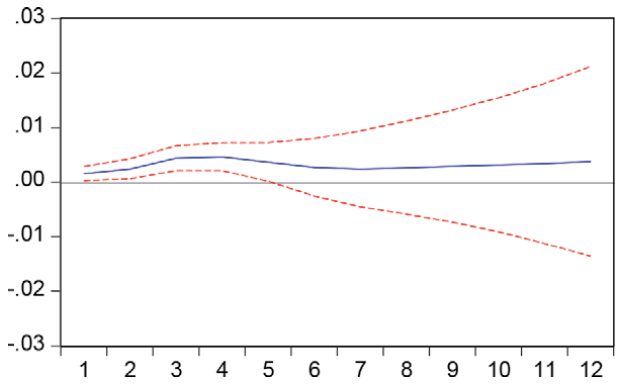

Figure 15.
Impulse response function of lnintr to lnexchr.

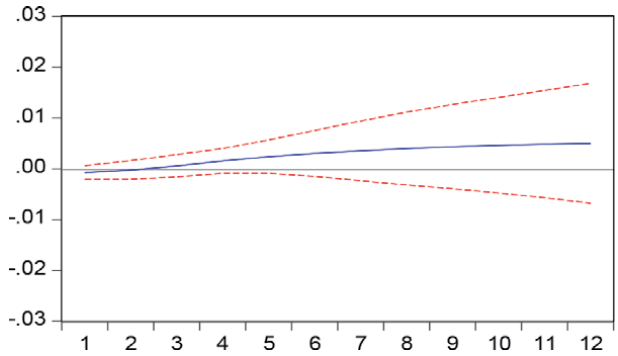

Figure 16.
Impulse response function of lnintr to lncpi.

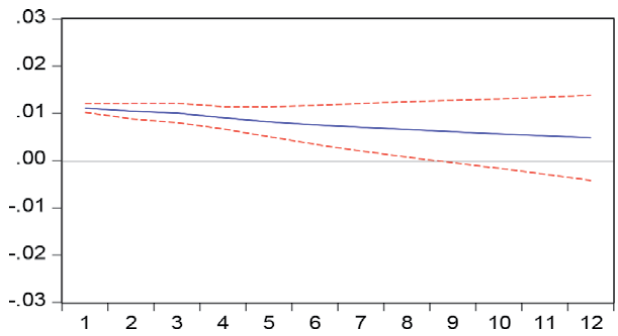

Figure 17.
Impulse response function of lnintr to lnintr.

from 24th period with 2.47% and keep increasing up to 25.02% in the 48th period (4th year). This is also affirmed in **Figure 11** in the appendix.

Similarly in the estimation of Granger Causality WALD Test for lnintr, it responded positively to change in lnoilpr and lnexchr. This is also in agreement with the estimation of forecast error variance decomposition of lnintr as an endogenous variable, contributing to its future error variation of 97.41%, 42.01% and 54.34% for the 1st, 12th periods and declined to 3.70% at the 48th period (4th year), this is followed by lnexchr which contributes 1.91%, 10.19% for the 1st and 6th perods, it declined for some periods and pick up again and continue rising to 82.81% in the

48th period (4th year). This is trailed behind by lnoilpr, contributing 4.32% and 43.37% in the 6th and 12th, 75.25% at 24th period and started declining up to 12.41% at the 48th period (4th year). This indicated that the major determinant factors of interest rate policy in Nigeria are change in price of oil and exchange rate in the long run. This also conforms to the outcome of the IRF in **Figure 14**, which specified further that the relation between lnintr and lnoilpr is an inverse relationship, while lnexchr, lncpi and lnintr in **Figures 15–17** are positive.

The object of this is work is to establish a direct link between oil price and some selected monetary instruments in Nigeria, and our a priori expectations were achieved, we were able to established that oil price has a direct influence on the exchange rate, interest rate and inflation rate. It is known facts that Nigeria is an oil-producing economy and at the same time also an import-based economy of non-oil products. The major sources of financing the import come from oil revenue. As an oil-producing economy, there are tendencies of having Dutch disease syndrome and economic pass-through [9]. Both in theory and empirical analyses one can conclude that oil price is a strong determining factor of the rate of exchange, it has a direct link to inflationary or deflationary tendencies and also influences the monetary policies in Nigeria in terms of cost of borrowing.

Therefore, in implementation of monetary policy by the policymakers, attention should be drawn to price level of import from the external market, that is by concurrently monitoring the domestic market and the economy of the country's trading partners. On a general note, there should be diversification of the economy from oil to the non-oil economy to avoid the Dutch disease syndrome.

Additional classifications

JEL classifications: *Q1, Q3, Q41, Q47*

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Chapter 6

FDI and Its Impact on Trade in the East Asian Transition Economies

Sung Jin Kang and Seon Ju Lee

Abstract

As globalization and trade liberalization have increased integration of the world economy through financial and trade flows, the role of FDI and trade on economic growth is becoming more influential. This paper investigates the impact of FDI on trade of the East Asian economic transition countries, namely the China, Cambodia, Lao PDR, and Vietnam, employing FDI flow and FDI stock data separately. The data from these four countries during the period 1990–2019 have been collected, and OLS and panel within fixed effect estimators are utilized. The main findings show that, first, when estimated using FDI flow as independent variable, there exists complementary effect between FDI and trade, and the coefficients are significant except for Cambodia. Second, when estimated using FDI stock as independent variable, the impact of FDI decreases and even substitutability effect is found in China at significant level. Third, in both cases, the coefficient of FDI is shown positive and significant in Vietnam. In addition, the paper finds the effects of human capital, GDP, and WTO accession on trade are positive, while the effects of exchange rate, financial development, and tariff rate vary among the East Asian economic transition countries.

Keywords: foreign direct investment, trade, East Asian transition economies, panel within fixed effect, China, Cambodia, Lao PDR, Vietnam

1. Introduction

In the last decade, global trade increased more than twice as fast as the global GDP and growth of FDI (foreign direct investment) outpaced the growth of global exports [1, 2]. According to WDI, Global trade volume accounted for 51% of global GDP in 2000, but as in 2019, it accounts for 60% of global GDP. Global FDI stock invested by global economies in 2019 were US$34 trillion at current price, which increased at significant pace considering that it was US$7.4 trillion in 2000.

This increase in global trade accompanied by a rapid growth of FDI intrigued a number of studies to investigate the role of FDI and trade on economic growth and the relationship between the FDI and trade. Most empirical studies find complementary relationship, while few find substitute effect of FDI on trade [2–6]. Some studies suggest the effect of FDI on trade depends on the type of FDI, type of industry, or income level of recipient countries [3, 7, 8]. While [3] finds complementary relationship between FDI and trade in most cases, he argues the impact of FDI on import is greater than export in developing countries in short term.

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Despite the effect of FDI on export can be negative (or relatively smaller than on import) for developing countries, FDI inflow enables transfer of technology and managerial skills from developed countries, hence leading to positive spillover [9]. Hence, role of FDI and trade are particularly important for emerging countries and transition countries who opened its economy quite recently.

A number of literatures classify the transition into three types: Germany, Former Soviet Union, and East-Asian types [10, 11]. This study is interested in East-Asian type in specific, covering China, Vietnam, Cambodia, and Lao PDR. These countries transformed the economic system to capitalistic market system through reform and opening up. However, they maintain their political system of one-party communist system. This type is often referred to economic transition countries.

The case of the East Asian economic transition countries is interesting as they have shown fast economic growth soon after they transited their economic system from socialist regime to market-oriented regime. China, Cambodia, Lao PDR, and Vietnam initiated economic reforms in 1979, 1989, 1986, and 1986, respectively. However, most of existing empirical studies investigate the trade determinants of specific country or countries in same geographical area or in similar development level. There is limited empirical evidence about the determinants of East Asian economic transition countries' regional trade development.

By examining the impact of FDI on trade of these East Asian economic transition countries, this paper provides more insight into the regional and global implications of FDI and trade in East Asian economic transition countries. Policy implications can be derived for the countries that have been experiencing economic transition such as Myanmar, Cuba and the country such as North Korea in the future. Therefore, through utilizing the panel fixed effect regression, this study investigates the impact of FDI on trade.

Empirical results show complementary effect between FDI and trade when estimated using FDI flow variable. To be specific, the effect of FDI on trade is shown the highest in the order of Vietnam, China, Cambodia, and Lao PDR although the coefficient of FDI is insignificant in Cambodia. When estimated using FDI stock variable, the complementary relationship between FDI and trade weakens, and even substitutability effect is found in China at significant level. Interestingly, the coefficient of FDI is positive and significant in Vietnam in both cases.

The rest of the paper is organized as follows. In Section 2, the paper briefly investigates the role, trend and relationship between the global trade and FDI with providing a related literature review. In Section 3, terminology related to economic transition and performance of trade and FDI of East Asian economic transition countries (China, Cambodia, Laos, and Vietnam) are reviewed. In addition, FDI policies of these countries are thoroughly analyzed. In Section 4, the paper provides empirical analysis and results in Section 5. Finally, Section 6 concludes the study with a discussion of our findings.

2. Global trade and FDI

2.1 The relationship between trade and FDI

Globalization and trade liberalization have increased integration of the world economy through financial and trade flows [12]. Global trade increased more than twice as fast as the global GDP in the last decade and growth of FDI outpaced the growth in global exports [1, 2]. **Figures 1** and **2** present the global FDI and trade trends from 1970 to 2019, former expressed in current billion US$ and latter

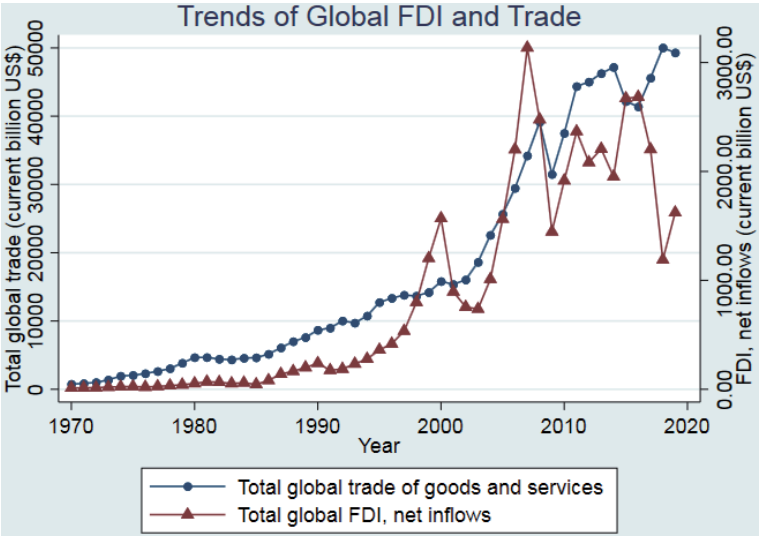

Figure 1.
Trends of global FDI and trade (current billion US$). Source: World Bank.

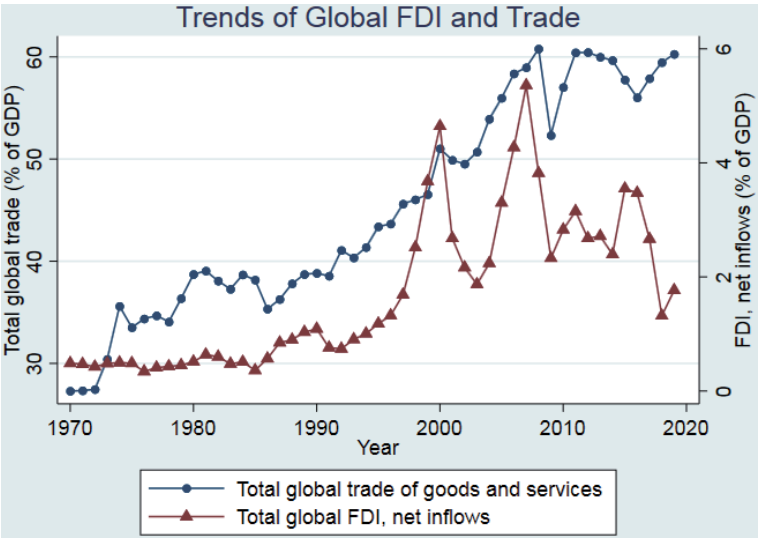

Figure 2.
Trends of global FDI and trade (% of GDP). Source: World Bank.

expressed in a ratio of GDP. Global trade volume accounted for 27% ($767 billion) of global GDP in 1970, 38% ($8.7 trillion) in 1990, and 51% ($15.8 trillion) in 2000. But as in 2019, it accounts for 60% ($49 trillion) of global GDP. Total global FDI net inflow was $12 billion in 1970, passing $100 billion in 1987, reaching $1.4 trillion in 2000, and $2.1 trillion in 2016.

The figures show that increase in global trade has been accompanied by a rapid growth of FDI. While trade gradually increases during the period both in terms of GDP or current US$, FDI shows a more volatile trend than trade with more fluctuations. Both trade and FDI fell significantly during the global financial crisis in 2008, seemed to recover, but are slowing down and decreasing in recent years. In particular, current FDI inflow ($1.6 trillion in 2019) is far below the highest record point of $3.1 trillion in 2007.

Before investigating the relationship between FDI and trade, the role of trade and FDI in economic growth is briefly explained. In general, FDI and trade development are both regarded to positively contribute to economic growth although the trends of FDI and global trade are not always correlated [3]. Theoretically, FDI is considered as an important exogenous source that enables capital accumulation of recipient countries. Inflow of FDI enables the recipient country to create new job opportunities, improve infrastructure, increase productivity, and therefore promote economic growth. Especially for developing countries, FDI inflow enables transfer of technology and managerial skills from developed countries, hence leading to positive spillover [9].

A number of studies have investigated the casual relationship between the FDI and trade flows. **Figure 3** presents the trend of the relationship between global FDI inflows and global trade volume during the period 1970–2019, both expressed in current billion US$. Clearly, the fitted line shows the complementary (positive) relationship between the two with some outliers. It is interesting that the lower the values of FDI and trade, more concentrated and fitted the values are to the fitted line. Referring from **Figures 1** and **2**, the low values are likely to present the early periods, therefore it can be implied that the variation increased over periods thus is harder to predict the relationship as time passes.

According to [3], global trade seems to generate FDI until the mid-1980s, but after this period, this cause-and-effect relationship reversed with FDI influencing the trade significantly. In addition, [3] finds that FDI outflow increases export of originating countries, and in recipient countries, import increases in short term, and export increases in long term. Nevertheless, he addresses that although FDI inflow can increase import rather than export, recipient country can still benefit from FDI by technology transfers, job creation, local subcontracting, and etc.

Likewise, the relationship between trade and FDI can be either complementary or substitute. Dinh and Hoai [4] investigate the impact of FDI and trade openness on economic growth in 22 Asia-Pacific developing countries from 1990 to 2011 using System GMM. They find that both FDI and trade openness positively contribute to economic growth in these countries and show complementary

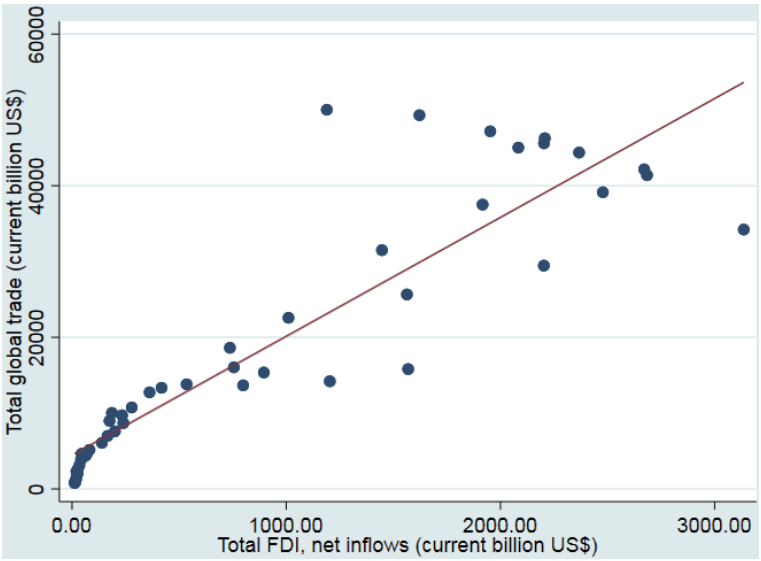

Figure 3.
Relationship between global FDI and trade (% of GDP). Source: World Bank.

relationship. Further, [5] examine the effect of FDI on trade in Vietnam from 1990 to 2007 utilizing a gravity model. They show that there exists a complementary relationship between FDI and trade although the impact is not significant. Cantwell and Bella (2000) argue there is a complementary relationship between FDI and trade with a growing influence of MNCs in international trade. Cantwell and Bellak [6] investigate 21 empirical studies on impact of FDI on trade in emerging countries, and conclude trade and FDI work as a complement in emerging countries.

On the other hand, utilizing system GMM estimators, [13] argue the combined effect of FDI inflow with trade openness negatively affect the economic growth, while they positively contribute when taken separately. They also address the importance of role of economic institutions on FDI and trade openness. Strengthening the argument, using gravity model, [2] also find the substitutability relationship between trade and FDI inflow in Portugal during 2000 and 2013. Interestingly, some studies suggest the effect of FDI on trade depends on the type of FDI, type of industry, or income level of recipient countries [3, 7, 8].

2.2 Literature review on determinants of trade

Global trade, a key economic indicator to examine a nation's health, is vital for developing countries, especially for the transition countries who opened its economy relatively recently, to attract investment, enhance competitiveness, and promote economic growth. It is influenced by various factors including factor endowments (land, labor, and capital), productivity, trade costs, trade policy (barriers to trade), exchange rate, inflation, tastes, and etc. Among the determinants of trade, productivity and factor endowments gained the most attention in the trade literature [14].

To examine the impact of FDI on trade, empirical studies on determinants of trade are investigated. Goswami [15] uses panel FMOLS (Fully Modified OLS) to examine the determinants of trade development of 5 South Asian countries (India, Pakistan, Bangladesh, Sri Lanka, and Nepal) from 1980 to 2010. Trade as a ratio of GDP is utilized as the dependent variable, while per capita income, average year of schooling (proxy for human capital), bank credit to private sector (proxy for financial development), tariff rate, FDI stock, exchange rate, and infrastructure index are utilized as explanatory variables. Effect of per capita income growth, human capital, infrastructure and financial development have shown significant positive on trade of South Asian countries, while the effect of exchange rate has shown significant negative.

Dauti [16] investigates the relationship between FDI and trade in the European region based on country characteristics, classifying into two groups of ten new members of EU and five South East European countries. Gravity model is utilized with FDI stock, GDP, skill and capital endowments and trade distances. Employing various static and dynamic panel estimation models, he finds positive impact of FDI on import, and negative impact of FDI on export. The coefficients of labor and capital endowments are shown positive and significant on both export and import. Interestingly, the impact of GDP per capita on export is shown negative and significant.

In the same line, [17] examine the trade determinants of 23 transition countries in Central and Eastern Europe countries using fixed effects, random effect, IV and GMM models from 2000 to 2015. FDI, GDP, investments (gross capital formation in a ratio of GDP), trade liberalization index (TLI), exchange rate are utilized as the trade determinants. FDI, investments, and TLI have shown positive impact on trade, while exchange rate and GDP have shown no significant effect. Using the result, they suggest transition countries to promote policies to improve human resources, business environment, governance, and infrastructure to increase export.

In addition, using ARDL (Autoregressive Distributed Lag) model, [18] analyze the determinants of trade in Finland for short-run and long-run from 1990 to 2019. Without using FDI as explanatory variable, they find the impacts of inflation, urbanization and exchange rate on trade balance are negative and significant, while the impacts of unemployment and GDP on trade balance are positive and significant for both for short-run and long-run.

Moreover, recent literature includes institutional factors as major determinants of trade balance [19, 20]. Employing GMM method, [19] investigate determinants of trade of 36 Sub-Saharan Africa (SSA) countries from 1996 to 2017. Not only FDI, but also regulatory quality, rule of law, inflation, population growth and access to sea are utilized as explanatory variables. Empirical result reveals that institutional determinants and FDI and access to sea lagged by one period enhances trade openness in SSA countries during the sample periods.

Furthermore, [21] studies the impact of FDI, exchange rate and trade openness on trade balance, which is measured by subtracting volume of import from volume of export. Using sample data covering over period during 2005 and 2018 in Vietnam, he finds the impact of FDI and trade openness on trade balance is negative and significant, while the exchange rate insignificantly influences trade balance.

Including the studies mentioned in this section, most empirical studies investigate the trade determinants of specific country or countries in same geographical area or in similar development level. There is limited empirical evidence about the determinants of East Asian economic transition countries' regional trade development.

3. East Asian economic transition countries

3.1 Concept of economic transition and performance

Transition generally implies a conversion of political • economic system into reformation • open-door system [10]. Political system transition refers to a transformation from communism system, where only 1 party is admitted, to a democratic system, where bases on a multi-party system. Economic system transition refers to a transformation from socialism system, where every economic decision is determined by the planned economy of the central government, to a capitalistic market system, where bases on a market mechanism.

However, it is not easy to clearly distinguish which form the transitions the countries in reality are following. A number of literatures classify the transition into three types: Germany, Former Soviet Union, and East-Asian types [10, 11]. This study is interested in East-Asian type in specific, covering China, Vietnam, Cambodia, and Lao PDR. These countries transformed the economic system to capitalistic market system through reform and opening up. However, they maintain their political system of one-party communist system. This type is often referred to economic transition countries.

Going through economic transition, these countries initiated trade liberalization and market-oriented reform process in late 1980s, intensifying further in 1990*s. china*, Cambodia, Lao PDR, and Vietnam started economic reform in 1978, 1989, 1986, and 1986, respectively. They have shown a fast economic growth soon after they transited to socialist market economy system, which is shown in **Figure 4**.

Figure 4 shows the trends of GDP per capita (in constant 2010 US$) of four East Asian economic transition countries and the data was collected from the World Bank WDI (World Development Indicators). Among four countries, China has shown the fastest growth, increasing from $720 in 1990 to $8,254 in 2019. GDP per

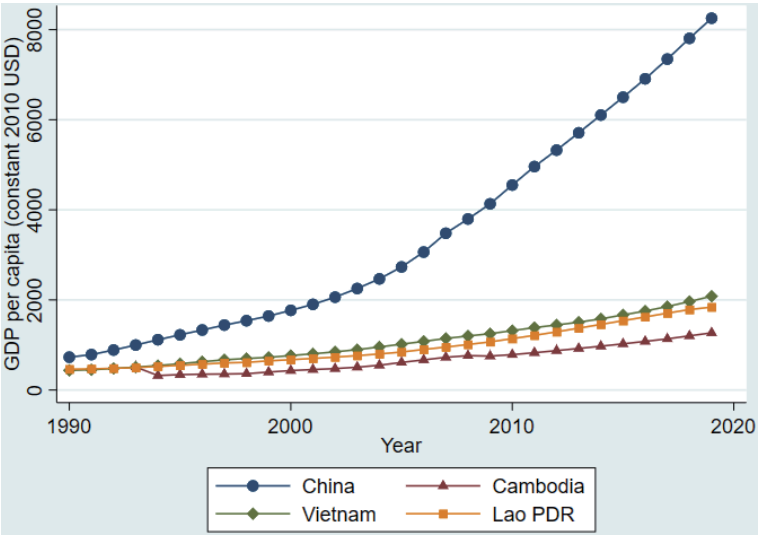

Figure 4.
GDP trends of east Asian transition countries. Source: World Bank.

capita of China almost doubled in the last 10 years. In case of Cambodia, GDP per capita increased from $321 in 1994 to $1,269 in 2019 with a small decrease in 2009. GDP per capita of Lao PDR increased from $462 in 1990 to $1,840 in 2019. In Vietnam, it increased from $433 in 1990 to $2,082 in 2019. Although Cambodia, Lao PDR, and Vietnam had similar starting point in early 1990s, Vietnam shows the highest improvement in GDP per capita, followed by Lao PDR and Cambodia, respectively.

Table 1 demonstrates current (2019) social and economic situations of the sample countries. Although they are all economic transition countries having same economic and political systems in common, they differ in development level, population growth, unemployment rate, and etc. First of all, except Lao PDR, rest of the countries have access to sea. In addition, Lao PDR has the highest population growth rate, following by Cambodia, Vietnam, and China, respectively. Furthermore, four countries show similar level of income inequality shown as Gini index score. Moreover, China has the highest unemployment rate of 4.6%, following by Vietnam of 2.04%, Lao PDR of 0.62%, and Cambodia of 0.13%, respectively. Last but not least, although China has the highest GDP per capita, Cambodia and Vietnam show higher GDP growth rate than China.

	China	Cambodia	Lao PDR	Vietnam
GDP per capita, PPP (current international $)	16,830	4,583	8,173	8,397
GDP growth rate (%)	6.11	7.05	4.65	7.02
Inflation rate, consumer prices (%)	2.90	2.46	3.32	2.80
Unemployment rate (%)	4.6	0.13	0.62	2.04
Gini index	38.5	37.9	36.4	35.7
Population growth rate (%)	0.46	1.49	1.55	0.99
Access to sea	O	O	X	O

Source: World Bank World Development Indicators (WDI).

Table 1.
Country characteristics of China, Cambodia, Lao PDR, and Vietnam.

3.2 Trends of trade and FDI

A number of studies investigate the major contributors of economic growth in East Asian economic transition countries, and often FDI inflows and trade liberalization are suggested as the main determinants [22–27]. Nevertheless, the relationship between FDI and trade remains one of the hottest debates as was argued in Section 2.1.

Figure 5 shows the trend of FDI net inflows in current billion US$ of China, Cambodia, Lao PDR, and Vietnam, and **Figure 6** shows the trend of trade in current billion US$ of the countries during the period 1990–2019. There are two y-axis in the figure, where left axis describes the status of China, while right axis describes

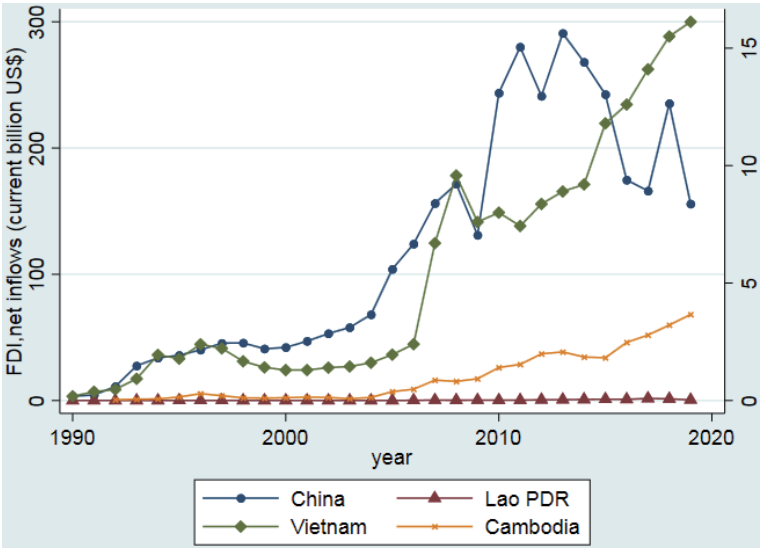

Figure 5.
Trends of FDI net inflows. Source: World Bank.

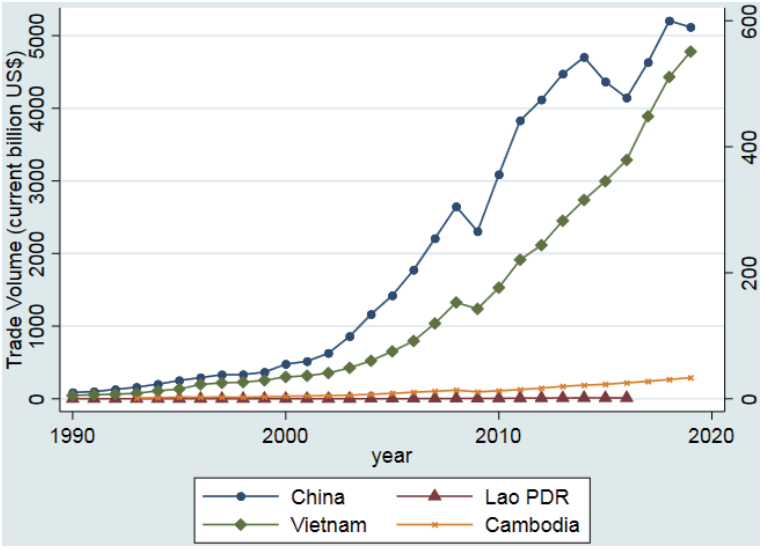

Figure 6.
Trends of trade volume. Source: World Bank.

the rest of the countries in both figures. Also, both figures are presented in the unit of current billion US$.

For the FDI net inflows presented in **Figure 5**, every countries show improving trends with some fluctuations. Starting economic reforms in 1978, China's FDI inflows gradually increased from $3.49 billion in 1990 to $235.36 billion in 2018, and reaching its record high of $290.928 billion in 2013.

While China shows fall in FDI inflow in recent years, FDI inflow in Vietnam has gradually increased since the implementation of the *Doi Moi* in 1986. Starting from $180 million in 1990, FDI inflows consistently increased, reaching $9.579 billion in 2008 with a small fluctuation during the global financial crisis, and continues to increase achieving new record every year. In the figure, Vietnam stays in higher point than China in recent years, but it should be noted that China is presented in different axis and it's about 15 times larger than it is shown in the graph compared to other East Asian economic transition countries.

In the case of Cambodia, who started the reform the last in 1989, FDI inflow was $33 million in 1992, remaining stable until the early 2000s, and rapidly increased since 2004 from $131 million to $3.663 billion in 2019.

Compared to other East Asian economic transition countries, FDI inflows in Lao PDR has shown relatively slow increase in the figure. Initiating economic reforms in 1986, FDI net inflows in Lao PDR started low as -$1.62 million in 1985, rising to $159.8 million in 1996, reaching the highest in 2017 of $1,693 million, and sharply decreased in 2019 of $557.2 million.

Compared to **Figure 5**, trends of trade volume of East Asian economic transition countries in **Figure 6** increase in stable pace with less fluctuation and small volatility. Every countries has shown significant increase in trade volume over the period although the trends of Cambodia and Lao PDR seem not improved notably relative to China or Vietnam in the figure. Trade volume of Lao PDR started at $310 million in 1990, surpassing $1 billion in 1994, reached the highest of $13 billion in 2014, and shows a decrease afterwards.

In case of Cambodia, trade volume shows a consistently increasing trend from $1.2 billion in 1993 to $33 billion in 2019. During the period, trade volume decreased only in 2009 from $13.8 billion in 2008 to $10.9 billion in 2009 attributed to the global financial crisis, but recovered afterwards by increasing its volume by $2 billion each year.

Although Lao PDR, Cambodia, and Vietnam had similar start in 1990, Vietnam shows the highest growth in trade volume from $5.26 billion in 1990 to $551 billion in 2019. Shown in the figure, it rapidly increases since 2009 similar to the case of Cambodia. Interestingly, major trading partners of Vietnam are the main foreign investors [7]. Although Vietnam shows rapid growth of trade compared to Cambodia and Lao PDR, the growth of import is faster than the export thus widening the gap between the import and export.

China's trade volume started at $87.6 billion in the initial stage in 1990, has speed up its growth since 2000s with a decrease in 2009, 2015, 2016, and 2019. Both export and import decreased during the fluctuations, and the fluctuations are more significantly shown if demonstrated in a ratio of GDP. Interestingly, export volume accounted for 36% of GDP in 2006, but only 18.4% in 2019 although the volume increased from $991 billion in 2006 to $2,641 billion in 2019.

Trade and FDI data that were collected for **Figures 5** and **6** are now presented in relationship in **Figure 7** as FDI net inflows in x-axis, and trade volume in y-axis during 1990–2019. Similar to **Figure 3**, trade and FDI show proportional relationship for every four East Asian economic transition countries. Cambodia shows the best fit, following by Vietnam, and Lao PDR, respectively. China shows the worst fit with some significant outliers as the value of FDI increases.

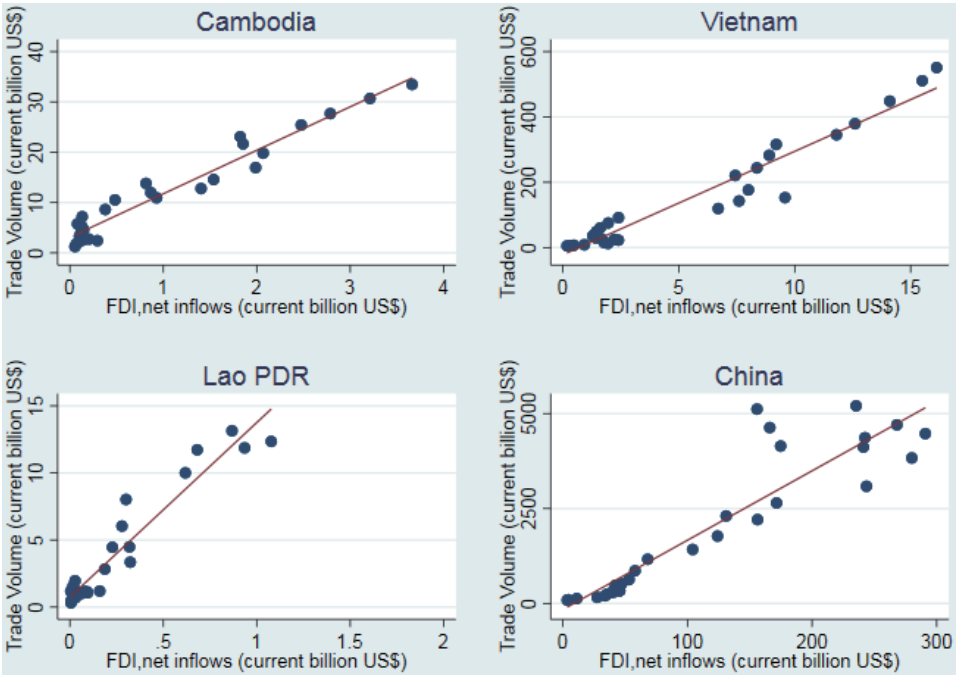

Figure 7.
Relationship between FDI and trade. Source: World Bank.

3.3 FDI promotion policies

To promote economic growth, all four East Asian economic transition countries have put significant efforts to attract FDI in various ways. Countries provide various investment incentives to foreign investors, equally treat foreign and domestic investors, and established special economic zones for further engagement. In addition, apart from Lao PDR, rest of the countries have one unified central government agency responsible for promoting FDI. For foreign investors to begin investment in these countries, they should contact the administrative control tower for FDI that are summarized in **Table 2**.

China first started to open up its economy by enacting the law for joint ventures in 1979 that granted a legal status for foreign investment and establishing four special economic zones (SEZs) in 1980. FDI promotion policies were modified several times and SEZ status were gradually extended to other industrial cities in 1984, 1985, 1990, and 1992 [29]. The *Provisions of the State Council of the People's Republic of China for the Encouragement of Foreign Investment* (22 Article Provisions) and the *Law of the People's*

	Organization(s)
China	• The Ministry of Commerce (MOFCOM)
Cambodia	• The Council of the Development of Cambodia (CDC)
Lao PDR	• The Ministry of Planning and Investment (MPI) • The Ministry of Industry and Commerce (MoIC)
Vietnam	• The Ministry of Planning and Investment

Source: author's summary modified from [28].

Table 2.
Administrative control towers for FDI.

Republic of China on Enterprises Operated Exclusive with Foreign Capital launched in 1986 enabled foreign investors to enter China as a wholly foreign-owned enterprise in some circumstances and provided strong incentives for FDI [30]. Inward FDI slowed down during the Asian financial crisis in late 1990s, but China's WTO accession in 2001 and amendment of laws to comply with WTO commitments acted as a catalyst for rapid growth in FDI inflow and expansion of types of FDI from manufacturing to tertiary sectors. The new Foreign Investment Law (FIL) was enacted in 2020 that replaced the existing investment laws on joint ventures and wholly foreign owned enterprises. The FIL includes foreign IP (intellectual property) rights and equal treatment of foreign and domestic companies regarding tax exemptions, licensing, government funds, and so on [31].

In Lao PDR, FDI promotion law was enacted in 1988 and was reformed several times, in 1994, 2004, 2009, and 2016 by the Investment Promotion Department (IPD) [28]. Reformation in 2009 has improved the foreign investment environment by equally treating domestic and foreign investors. Further, Special and Specific Economic Zones (SSEZ), where have independent investment procedures and provides one-stop-services for investors, was established in 2003 to attract more FDI in the country. The Ministry of Industry and Commerce (MoIC) and the Ministry of Planning and Investment (MPI) are the administrative control towers responsible for promoting FDI. Former operates administration process for general business activities, and the latter operates administration process for concession business activities and investment in SSEZ.

After devastating war in Cambodia, FDI promotion law was first initiated in 1994 to attract FDI to rehabilitate the destroyed infrastructure and enhance growth. The Council of the Development of Cambodia (CDC) plans, operates, inspects, evaluates, and also rehabilitates national investment system and projects. In 2005, the CDC established Cambodian Special Economic Zone Board (CSEZB) to plan and launch special economic zones that offer one-stop service, similar to Lao PDR's SSEZ [32].

	Legislations and Decrees	Year of Enactment (Amendment)
Cambodia	Law on Investment of the Kingdom of Cambodia	1994 (2003)
	Sub-decree on the Implementation of the Law on the Amendment to the Law on Investment on the Kingdom of Cambodia	2005
	Sub-decree on the Organization and Functioning of the Council for the Development of Cambodia	2005
Lao PDR	Law on Investment Promotion	2009
	Decree on the Implementation of the Investment Promotion Law	2011
Vietnam	Law of Foreign Investment	1987 (2014)
	Law on Enterprises	2005 (2014)
	Decree on Guidelines for Some Articles of the Law on Investment	2015
	Decree on Investment in the Form of Public-Private Partnership	2015
China	Law on Joint Ventures using Chinese and Foreign Investment	1979 (1990)
	Law on Enterprises Operated Exclusive with Foreign Capital	1986
	The Foreign Investment Law (FIL)	2020

Source: author's summary modified from [28].

Table 3.
FDI-related laws in China, Cambodia, Lao PDR, and Vietnam.

Vietnam started to attract FDI since enacting the Law of Foreign Investment in 1987. The law was reformed several times and was lastly revised in 2014. Export processing zones that provide special incentives were established in 1991 in accordance with the amended law of foreign investment. Anwar and Nguyen [5] argue FDI was a major factor that contributed the country transform from an agricultural based economy to an industrialized based economy. Similar to Lao PDR, MPI is responsible for promoting FDI in Vietnam, but more extensively. MPI in Vietnam not only plans, manages, and operates the national investment system, but also inspects overall investments in Vietnam. Major FDI related legislations and decrees of East Asian economic transition countries are summarized in **Table 3**.

4. Empirical model specification

The empirical analysis presented in this paper is based on a long panel data set which involves four East Asian economic transition countries over the period 1990–2019. In order to examine the effect of FDI on trade in East Asian economic transition countries (China, Cambodia, Lao PDR, and Vietnam) from 1990 to 2019, this paper utilizes OLS and panel within fixed effect model to take account of unobserved time invariant country-specific effects such as languages, trade distances, and geographical borders. Referring from reviewed literatures in Section 2.2, the general panel regression equation is as follows.

$$\ln(TRADE)_{it} = \beta_0 + \beta_1 \ln(FDI)_{it} + \beta_2 \ln(GDP)_{it} + \beta_3 \ln(HUM)_{it} + \beta_4 \ln(EXC)_{it} + \beta_5 \ln(TAR)_{it} + \beta_6 \ln(FINA)_{it} + \beta_7(\mathrm{WTO})_{it} + \alpha_i + \varepsilon_{it}, \quad (1)$$

where $(TRADE)_{it}$ is the dependent variable which is measured by the sum of exports and imports of goods and service of country i at time t, expressed in a ratio of GDP. FDI is the inward FDI stock, expressed in current million $US, HUM is the variable for human capital proxied by tertiary school enrollment, EXC is the official exchange rate, expressed in local currency per US$, and TAR is the weighted tariff rate of all products. FINA measures bank credit to private sector as a proxy for financial development, expressed in a ratio of GDP, WTO is a dummy variable for country's WTO compliance, values 1 for country's accession, or 0 otherwise, α_i is a time invariant error, and ε_{it} is an idiosyncratic error. The issue of this general equation is that there exists a time invariant component and individual-specific components of the error term that are correlated with the independent variables.

Hausman's specification test was conducted to distinguish if there is a significant bias in a random effects or fixed effects. Based on the results of Hausman test, fixed effect model is consistent and favored over the random counterpart, hence, this study uses fixed effects transformation from the above equation by subtracting off the mean over time for each country so that demeaning transformation eliminates the α_i term and only demeaned idiosyncratic error term is left. Also, within fixed effect model was utilized as within variation of variables were greater than between variation. This modified model specification is as follows:

$$\ddot{\ln}(TRADE)_{it} = \beta_0 + \beta_1 \ddot{\ln}(FDI)_{it} + \beta_2 \ddot{\ln}(GDP)_{it} + \beta_3 \ddot{\ln}(HUM)_{it} + \beta_4 \ddot{\ln}(EXC)_{it} + \beta_5 \ddot{\ln}(TAR)_{it} + \beta_6 \ddot{\ln}(FINA)_{it} + \beta_7(\mathrm{WTO})_{it} + \ddot{\varepsilon}_{it} \quad (2)$$

Variable	Definition	Expected sign	Source
TRADE	Sum of exports and imports of goods and services (current $US)	Dependent variable	WDI
FDI	Inward FDI stock / FDI net inflows (current $US)	+	UNCTAD
GDP	GDP per capita (constant 2010 US$)	+	WDI
HUM	Expected years of schooling (of children) (years)	+	UNESCO
EXC	Real effective exchange rate (CPI based)	+/−	Brugel Datasets
TAR	Tariff rate, weighted mean, all products (%)	−	WDI
FINA	Domestic bank credit to private sector (% of GDP)	+	WDI
WTO	WTO accession (1 for country's WTO accession, 0 otherwise)	+	WTO

Table 4.
Variable description.

where $(\ddot{TRADE})_{it}$ is $TRADE_{it} - \overline{TRADE_{it}}$, and same for other variables as well. For this fixed effect estimator to be consistent, independent variables and the error term should not be correlated to prevent endogeneity problem and reverse causality effect [33, 34].

Table 4 describes the utilized variables, its source and expected signs. TRADE data is collected from WDI (World Development Indicators), and is the sum of exports and imports of goods and services. FDI data has been sourced from the UNCTAD (United Nations Conference on Trade and Development). FDI stock variable was utilized instead to FDI flows to avoid time lag and multicollinearity problems between trade and investment [3].

GDP, HUM, TAR, and FINA data are sourced from WDI, and EXC data are collected from the Brugel Datasets. Country's WTO accession date is searched from the member information section of WTO website [35]. As countries have to refine its policies to comply with WTO trade principles, expected sign of WTO is positive. Further, expected impacts of FDI, GDP, HUM, and FINA on TRADE are also positive, while the expected sign of TAR is negative, and EXC can have both positive and negative impact on trade.

Table 5 presents summary statistics of collected variables for China, Cambodia, Lao PDR, and Vietnam from 1990 to 2019. Missing values of data are replaced with

Variable	Obs	Mean	S.D.	Min	Max
$\ln(TRADE)_{it}$	120	24.2179	2.6335	19.553	29.2805
$\ln(FDI\_flow)_{it}$	120	21.2765	2.8609	15.3087	26.3963
$\ln(FDI\_stock)_{it}$	120	9.205	2.8042	2.6064	14.3862
$\ln(GDP)_{it}$	120	6.991	.7608	5.7754	9.0186
$\ln(HUM)_{it}$	120	2.2338	.9369	.506	4.003
$\ln(EXC)_{it}$	120	4.7187	.1635	4.3531	5.0839
$\ln(TAR)_{it}$	120	2.3418	.6133	.5481	3.5016
$\ln(FINA)_{it}$	120	3.4407	1.2227	.5197	5.11
$(WTO)_{it}$	120	.4583	.5004	0	1

Table 5.
Summary statistics (1990–2019).

imputed values, where missing values between the collected values are replaced by its mean and missing values before and after the collected values are replaced by the first and last collected data.

5. Empirical results

Before performing the estimations, F parameter test for fixed effects was conducted, which resulted in F statistic ($F(3,109) = 112.25$, $P > \chi^2 = 0.00$) large enough to show there is significant group effect, thus fixed effect model is preferred over OLS. In addition, fixed and random effect models are compared based on the Hausman test. Hausman test resulted in p-value ($\chi^2(3) = 84.61$, $P > \chi^2 = 0.00$) small enough to reject the null hypothesis and favors fixed effect over random counterpart. Further, Breuch-Pagan LM test favored OLS over random effect, thus results of OLS and fixed effect estimation are presented in **Tables 6** and 7, former using FDI flow, and latter using FDI stock as independent variable.

In **Table 6**, the results of the OLS and fixed effect estimation for the Eq. (1) and (2) are presented utilizing FDI inflow as independent variable. Models (1) are (2) estimated regarding every four East Asian economic transition countries using OLS, and fixed effect, respectively, while Models (3), (4), (5), and (6) are estimated for each country.

Variables	(1) OLS	(2) FE	(3) China	(4) Lao PDR	(5) Vietnam	(6) Cambodia
lnFDI_flow	0.611***	0.157***	0.197***	0.125***	0.217***	0.152
	(0.0490)	(0.0365)	(0.0527)	(0.0290)	(0.0277)	(0.119)
lnHUM	0.147	0.501***	0.315	0.345*	0.307***	0.0887
	(0.124)	(0.0898)	(0.244)	(0.189)	(0.0464)	(0.197)
lnGDP	0.714***	0.693***	1.168***	1.281*	2.276***	−0.708**
	(0.155)	(0.144)	(0.270)	(0.619)	(0.216)	(0.268)
lnFINA	0.286***	0.155**	−1.063***	0.276***	−0.158	1.227***
	(0.108)	(0.0601)	(0.307)	(0.0870)	(0.0953)	(0.191)
lnEXC	−1.394***	0.231	0.0104	0.280	−0.373*	−3.346***
	(0.383)	(0.235)	(0.331)	(0.301)	(0.186)	(0.785)
lnTAR	0.0203	−0.225**	−0.170	0.187	−0.154**	0.418
	(0.166)	(0.102)	(0.117)	(0.196)	(0.0564)	(0.279)
WTO	0.0133	0.0313	0.144	0.185	−0.0936	0.0743
	(0.162)	(0.107)	(0.106)	(0.136)	(0.0633)	(0.235)
Constant	11.43***	13.81***	17.94***	7.539	6.524***	35.48***
	(2.226)	(1.410)	(1.580)	(4.999)	(0.696)	(4.090)
Observations	120	120	30	30	30	30
R-squared	0.969	0.967	0.996	0.993	0.999	0.978
Number of countries	—	4	1	1	1	1

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

Table 6.
Estimation results using FDI inflows.

Variables	(7) OLS	(8) FE	(9) China	(10) Lao PDR	(11) Vietnam	(12) Cambodia
lnFDI_stock	0.0102	0.0165	−0.278*	−0.0525	0.202***	−0.114
	(0.107)	(0.0466)	(0.155)	(0.105)	(0.0564)	(0.134)
lnHUM	5.825***	5.251***	2.663***	8.276*	4.124**	13.64***
	(1.351)	(0.770)	(0.823)	(4.792)	(1.752)	(3.843)
lnGDP	0.368	0.731***	2.093***	1.182	2.676***	0.0875
	(0.358)	(0.133)	(0.232)	(0.878)	(0.303)	(0.334)
lnFINA	1.198***	0.422***	−1.041***	0.206	−0.348**	0.544*
	(0.0962)	(0.0518)	(0.327)	(0.128)	(0.146)	(0.264)
lnEXC	−0.815	0.906***	−0.211	1.949***	−0.126	−0.122
	(0.606)	(0.241)	(0.338)	(0.611)	(0.316)	(0.838)
lnTAR	0.151	−0.0583	0.00835	0.258	0.00273	0.144
	(0.233)	(0.109)	(0.137)	(0.236)	(0.107)	(0.207)
WTO	0.275	0.128	0.0749	0.0838	0.121	0.183
	(0.237)	(0.109)	(0.111)	(0.182)	(0.0878)	(0.174)
Constant	9.927***	3.550*	12.84***	−11.43**	0.203	−2.854
	(3.679)	(1.876)	(3.168)	(4.823)	(3.210)	(9.533)
Observations	120	120	30	30	30	30
R-squared	0.937	0.966	0.996	0.988	0.998	0.987
Number of countries	—	4	1	1	1	1

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

Table 7.
Estimation results using FDI inward stocks.

Except Model (6), the impact of FDI_flow on TRADE is shown positive and significant in every model at the .01 level. For Model (1), one unit increase in FDI_flow is expected to increase TRADE by 0.611 units, holding all other variables constant. When time invariant effects are controlled in Model (2), the coefficient of FDI_flow decreases to 0.157, but stay at the .01 significance level. Among the four East Asian economic transition countries, the impact of FDI_flow on TRADE is show the highest in Vietnam, followed by China, Cambodia, and Lao PDR, respectively.

In Model (1), the sign of the coefficients of explanatory variables are shown as the study expected except for TAR. Although the coefficient of TAR is negative, it is insignificant. Also, when the time-invariant effects are controlled, the impact of TAR on TRADE is shown negative and significant in Models (2) and (5). This implies that increase in tariff rate negatively affects trade development of the country, especially in the case of Vietnam.

In addition, the coefficients of HUM are shown positive and significant in Models (2), (4) and (5) and positive but insignificant in other models. This indicates that human capital, proxied by the expected years of schooling, is important to improve trade development of the country. Interestingly, while the coefficients of GDP and FINA are shown positive and significant in most of the models, the coefficient of GDP is negative in Cambodia at the .05 level and the coefficient of FINA is negative and significant in China at the .01 level. This result suggest that

GDP growth or financial development does not always promote trade in the economy.

Moreover, the coefficients of EXC are shown negative and significant in Models (1), (5), and (6), particularly high in Cambodia. This implies that increase in exchange rate deteriorates the trade of the economy in Cambodia by decreasing export volume as the price of domestic goods and services rises relatively to other foreign competitors. The impact of WTO accession is shown positive in every model except for Vietnam, but the coefficients are not significant.

Utilizing FDI stock as independent variable, the results of the OLS and fixed effect estimation are presented in **Table 7**. Contrary to the estimation results in **Table 6**, the coefficients of FDI_stock are positive but insignificant in Models (7) and (8). Even, it is shown negative and significant at .1 level in China, while it is positive at the 0.01 level in Vietnam. This result suggests that the relationship between the trade and FDI may significantly differ in empirical studies by the unit they are utilizing, and substitutability relationship could be found when FDI stock is used as explanatory variable.

In addition, the coefficients of HUM are shown positive and significant in every model, and the coefficients of GDP are also shown positive and significant in most models. Similar to Models (3) and (5) in **Table 6**, in Models (9) and (11), the coefficients of FINA are shown negative and significant in China and Vietnam. However, contrast to **Table 6**, the impact of exchange rate on trade is shown positive and significant in fixed effect model and in Lao PDR. This implies that the increase in exchange rate in Lao PDR is likely to increase imports in large amount. Last but not least, the coefficients of TAR and WTO are insignificant in every model in **Table 7**.

6. Conclusion

This study aims to investigate the relationship between trade and FDI in four East Asian economic transition countries, namely the China, Cambodia, Lao PDR and Vietnam. Complementary effect between FDI and trade is found when estimated using FDI flow variable. To be specific, the effect of FDI on trade is shown the highest in the order of Vietnam, China, Cambodia, and Lao PDR although the coefficient of FDI is insignificant in Cambodia. When estimated using FDI stock variable, the complementary relationship between FDI and trade weakens, and even substitutability effect is found in China at .1 significance level. Interestingly, the coefficient of FDI is positive and significant in Vietnam in both cases.

Other explanatory variables are also considered, which are human capital proxied by expected years of schooling, GDP, Domestic bank credit to private sector as a proxy for financial development, exchange rate, tariff rate, and WTO accession. Effects of GDP and human capital on trade are shown positive and significant in most cases except in Cambodia when FDI flow is utilized. Moreover, impact of financial development, tariff and exchange rate varies by model and country. Finally, the impact of WTO accession on trade is shown positive but insignificant, except for Cambodia, which shows negative coefficient when FDI stock is utilized.

These findings provide more insight into the regional and global implications of FDI and trade in East Asian economic transition countries. First, as impact of FDI on trade is shown positive, these countries should carefully promote FDI policies to maximize the benefits of FDI on trade and economic growth. Moreover, policy implications can be derived for the countries that have been experiencing economic transition such as Myanmar, Cuba and the country such as North Korea in the future.

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Conflict of interest

The authors declare no conflict of interest.

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Section 2

Managing Global Trade Under New Context

Chapter 7

Global Business Challenges and the Role of Corporate Diplomacy

Maria Alejandra Madi

Abstract

Today, corporate diplomacy refers to a new business governance model in a challenging global order where economic complexity, uncertainty and potential sociopolitical conflicts should be considered in any successful policy and strategy. Indeed, taking into account that the practice of corporate diplomacy enhances the redistribution and reallocation of economic power and wealth, there seems to be a global trend away from the shareholder business model of value creation towards a new one where stakeholders might be considered. However, there has been a controversial understanding of this new global management trend in terms of the configuration of relevant features of market dynamics. Considering this background, and adopting the methodological perspective of case studies, this chapter elaborates an analysis (i) of the complex drivers that shape corporate diplomacy competencies and strategies and (ii) of the potential results of corporate diplomacy in a global trade scenario that has been deeply affected by the coronavirus pandemic. Among the key findings, the Brazilian experience after the outbreak of the coronavirus pandemics shows that the role of corporate diplomacy as a business tool of governance aimed to defend sectorial interests might be crucial to normalize trade flows.

Keywords: corporate diplomacy, stakeholders, normalization of global trade, coronavirus pandemics, governance

1. Introduction

Corporate diplomacy refers to a new business governance model in a challenging global order where economic complexity, uncertainty, and potential sociopolitical conflicts must all be taken into account in any successful policy and strategy. Indeed, given that corporate diplomacy influences the redistribution and reallocation of economic power and wealth, there appears to be a global trend away from the shareholder business model of value creation towards a new one that takes stakeholders into account. However, in terms of the configuration of relevant market dynamics, there has been a contentious understanding of this new global management trend.

The practice of corporate diplomacy aims to build reputations and relationships with external stakeholders [1]. In this attempt, the goals to consider refer not only to the immediate results, but also to the long-term effects of any policy or strategy. This perspective is nowadays relevant since the current investment chain is complex due to complex interactions not only between investors and managers, but also among other stakeholders [2–4].

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Considering the evolution of global business models since the 2000s, they can be apprehended as a form of governance that aims increasing short-term earnings by means of a "clash of rationalization". The economic and social outcomes have involved a trend to 'downsize and distribute', that is to say, a trend to restructure, reduce costs and focus on short- term gains. In practice this has meant plants displacement and closures, changing employment and labour conditions, outsourcing jobs, besides the pressure on supply chain producers in the global markets. Therefore, within this business model, investments that are fixed for society turn out to be liquid for investors. The dominance of a culture based on short-termism has major implications that go far beyond the narrow confines of the financial markets. In this setting, the costs of this business model fall disproportionately on society because of the commitment to liquidity.

Against this backdrop, we address that corporate diplomacy is a new tool of governance that emphasizes collaborating with governments to develop societal rules to govern business conduct. Corporate diplomacy is a promising approach to business governance in order to learn how to create and change global rules for better outcomes in business, society and trade. In short, the relevance of this relies on the growing concern on the management of common-pool resources at local and global levels where polycentric systems of governance refer to build collective-actions.

At this respect, Elinor Ostrom in her 1990 well-known book *Governing the Commons: The Evolution of Institutions for Collective Action* considered there is not one ideal governance regime, but a variety of regimes of governance that might include: rules of appropriation and maintenance of resources, rules for of conflict resolution, besides the evaluation of strategies to change rules. Focused on the capacity of people around the globe to create long-run resilient arrangements for protecting environmental resources. In particular, she studied how groups of people manage and preserve common-pool resources such as forests and water supplies. However, collective actions have not inevitably emerged in all groups of people. She defined common or common-pool resources as public goods with finite benefits. Therefore, common-pool resources can be potentially used beyond the limits of sustainability because of the lack of exclusion of users. This creates an incentive for increasing the rate of use of this resource above its physical or biological renewal. Besides, her research pointed out that common property is a kind of institutional arrangement that regulates ownership and responsibility.

Considering this framework, the users of common-pool resource can work together to enhance the sustainable governance of their commons by collective action. Indeed, under her view, successful commons' self-governance institutional arrangements depend on: the coherence between the resource environment and its self-government structure, the enforcement of rules through effective monitoring and sanctions, and the adoption of low-cost conflict resolution mechanisms.

According to Ostrom, adaptive governance is related to changing rules and enforcement mechanisms over time since institutional arrangements are able to cope with human and natural complex systems. As a result, citizens, governments and businessmen might deal with collective-action problems in different ways at diverse scales. Indeed, her contribution adds to our understanding how collective actions and polycentric arrangements of governance can influence economic outcomes, human behaviors and institutions towards growing resilience and sustainability. In this attempt, she crossed traditional boundaries between political science and economics. Indeed, Ostrom's proposal is at the core of ethical business.

Drawing on the relevance of different governance regimes in business, it is interesting to note that most of academic literature focuses exclusively on the analysis of voluntary agreements in more developed countries or regions [5]. For instance, Magali A. Delmas and Maria J. Montes-Sancho [6] compare two theories

that can be used to evaluate corporate initiatives and that serve to explain the motivation of actors to participate in voluntary agreements: institutional theory and the theory of collective action. The theory of collective action argues that companies participate in corporate sectoral strategies much more to maximize gains than to protect the common good. These gains may also be reputational or purposive. In turn, the institutional theory is complementary and helps in understanding how the social context influences the firm's actions. In this sense, this theory argues that companies enter into collective agreements in response to social pressures and to improve their reputation. For the authors, voluntary agreements are signed between companies and regulatory agents, in which the former commit to commitments to address environmental issues and reduce their impacts on the environment. These agreements can be created in response to a new regulation, to make its implementation more flexible, or even to encourage the creation of new regulatory practices. In general, the authors indicate that these agreements can be created in two ways. The first occurs when industries of the same sector voluntarily commit to reducing their environmental impact, and these commitments are usually coordinated by an industry association. The second form refers to those initiatives in which the government and the industry agree on common commitments. In their study, Delmas and Montes-Sancho highlight factors that may explain the behavior of companies to participate in voluntary agreements. Among these factors, firstly, the authors point out that the greater the political and social pressure on companies in their home countries, the greater the chances of these companies participating in voluntary agreements. Secondly, the performance of industry associations also plays an important role for the emergence of effective sectorial initiatives.

Considering this background, the present study is centred on the Brazilian case also aims to fill the literature gap and contribute to the existing knowledge on corporate governance. The main goal is to analyze how corporate diplomacy in Brazil has been used as a tool of governance to manage the consequences of the global trade challenges in 2020. This methodology is considered appropriate to analyze specific business actions in order to elaborate some generalizations that might be of theoretical interest for the definition of further business strategies oriented to global trade.

In this attempt, the first section presents an overview of the business scenario in retrospect. Second, we explore an analysis of the complex drivers that shape the shift towards the emergent role of corporate diplomats with new competencies and strategies under the new normal. Third, considering the Brazilian experience, we briefly present a case study to show the outcomes of corporate diplomacy as a tool of governance in a global trade scenario severely impacted by the coronavirus pandemic. Finally, the conclusions summarize the key findings about new governance tools that might be relevant for business management in a complex global trade order.

2. The global business scenario in retrospect

Business strategies around long-run investment and profits have varied over time. In the context of the post Second World War it was widely spread that for a firm's long term sustainability and profitability it was necessary to invest in long term expansion and to improve workers' relative wages. This was also a "golden age" for workers' rights and organization practices. Indeed, Lazonick and O'Sullivan have described this business trend as a strategy of 'retain and reinvest' where profits were retained by the company and reinvested into productive capacity [7, 8].

However, this scenario began to change during the 1970s and 1980s. The new phase of financial dominance was concomitant with the reconfiguration of the international monetary system under the dollar supremacy after the 1980s that fostered the processes of globalization and financial deregulation. As a result, the historical changes in business have been related to qualitative transformations in capital accumulation and competition. The changing practices on corporate finance fostered the growth of the participation of institutional investors, such as pension funds or private equity firms, in business management as relevant shareholders. As a result, there was a change from reinvestment towards a strategy of maximizing short-term value for shareholders. The drive to increase the share-holders' value and the incorporation of the managerial strata through share options tended to postpone long-term investments. In addition, these practices favored mergers and acquisitions and fostered financial speculation. As a matter of fact, the financial conception of investment increased in the context where financial innovations aimed to achieve fast growth with lower capital requirements to improve short-term results [9].

In fact, the centralization of capital, through waves of mergers and acquisitions, created new challenges to business stability. In this scenario, the economic and social outcomes have involved a trend to 'downsize and distribute', that is to say, a trend to restructure, reduce costs and focus on short- term gains. In practice this has meant plants displacement and closures, changing employment and labour conditions, outsourcing jobs, besides the pressure on supply chain producers in the global markets. The costs fall disproportionately on labour because the new priorities of shareholder value limit the social responsibility of firms.

Changes in corporate governance and power relations have happened in the context of financial liberalization. There is no doubt that since 1970s the process of financial deregulation and financialization has radically changed the way banks, non-banks and non-financial institutions work and interact with the real economy. Within this setting, the evolution of central banks' policies and private strategies has influenced the dimension and composition of the balance sheets of the different sectors of the economy. Among the main features:

- Commercial banks, although they still perform their peculiar function of creating new purchasing power ex-nihilo and continue to provide initial finance to both non- financial business and households, they have been ensuing major increase in cash assets.

- The household sector has got increasingly indebted.

- Corporations have moved to "surplus units" running financial surpluses that have been diverted towards the acquisition of financial assets instead of financing physical investments.

- The balance sheets of mutual investment funds are now larger that before the crisis with respect to the GDP and they have influenced the flows of investment in companies.

Market deregulation has been associated to great transformations in the models of economic growth. While some countries have presented a consumption-driven growth model fueled by credit, generally followed by current account deficits, other countries have shown an export-driven growth model, mainly characterized by modest consumption growth and large current account surpluses. In spite of the coexistence of different growth models, the financial-led accumulation regime has presented some distinctive features:

- A redefinition of the role of the state that has been justified by the deregulation process in financial, product and labour markets.

- Changes in macroeconomic policies that turned out to focus fiscal adjustments instead of employment goals.

- The centralization of capital, trough waves of M&A and the expansion of sub-contracting schemes (outsourcing) that has been nurtured by short-term profit goals. In fact, one of the most important changes in investment decisions resulted from the increased pressure of shareholders. Assets, debts, current stock market evaluation, mergers and acquisitions have overwhelmed the practice of investment decisions. Indeed, the financial conception of investment has increased in the context where financial innovations (debt and securities) could be used to achieve fast growth with lower capital requirements.

- The redefinition of labour and working conditions that has been at the center of increasing inequality. In truth, the evolution of the capitalist relations of production has revealed changing labour organizing principles in order to cope with the dictates of capital mobility and competition: automatic production control; redefinition of workers' skills and tasks in the context of new management practices, job rotation and suppression of rights. Besides, attacks on trade unions and the diminishing organizational strength of collective demands need to be underlined. In this context, the deterioration of income distribution and the weak perspectives of job creation are continuously putting a downward pressure on consumption and, therefore, on economic growth.

In short, the financial markets have not only grown in size but also mutate the composition: the changing role of the traditional banking system and the expansion of shadow banking since investment funds have become the main features of current financial systems. The evaporation of the traditional distinction between bank-centred and market-centered financial institutional set ups imposed by the post-World War II tight regulation of the financial system has imposed new analytical challenges. Accordingly the Çelik and Isaksson [10], the current investment chain is complex due to cross-investments among institutional investors, increased complexity in equity market structure and trade practices, and an increase in outsourcing of ownership and asset management functions. In addition, ownership engagement plays an important role for effective capital allocation and the informed monitoring of corporate performance.

The expansion of financial accumulation has increased the wealth and power of the owners of capital whose assets are embodied in securities, bonds, shares, etc. Meanwhile, financial firms have increasingly dominated firm groups. Considering the evolution of the business models since the 1990s, the corporations' strategies turned out to focus on short-term gains and the distribution of dividends to shareholders, that is to say, to investors. In other words, the business model of the large enterprises could be apprehended as a form of governance that aims increasing short-term earnings by means of a "clash of rationalization". In this context, managers have stimulated the re-composition of tasks, labour turnover, the dismissal of workers, in addition to outsourcing. Therefore, competitiveness and productivity have been put together in the attempt to promote higher business performance. As a result, not only operational strategies in production (suppliers, labor, etc.) but also marketing and commercialization strategies (logistics, mark-up, market share, customer relationship, etc.) have been relevant to face the productivity challenges and efficiency targets.

In the private equity business model, managers are designated to monitor the private equity funds' portfolio companies on their behalf. Private equity funds belong to complex landscape of institutional investors that could be bifurcated as traditional (i.e., pension funds, investment funds including mutual funds, and insurance companies) and alternative (i.e., sovereign wealth funds, private equity, hedge funds). Jensen [11] found that takeovers, leveraged buyouts and other going-private transactions, like the private equity forms, are manifestations of the emergence of new organizations where resources could be managed more effectively than in public corporations. Once a target is selected, the fund acquires a controlling interest in that portfolio company with the general partners directing the company's business and affecting policy at the company level. Jensen's perspective highlights that private equity firms improve performance of their portfolio companies after the takeovers. Given higher levels of debt, managers have to increase operational returns in order to focus on regular payments to debtholders. Secondly, the monitoring role of the private equity firms could exert pressure on underperforming managers in order to achieve the targeted goals.

Within the private equity institutional set up, investors and managers do not assume an irrevocable commitment with the business they own [12]. In the last decades, the burgeoning emphasis on short-term performance, and the move to portfolio managers had a profound impact on mutual fund investment investors' strategies, most obviously in soaring portfolio turnover. Private equity funds reveal the power of centralized money to define investment flows and threaten the stability of a modern economy of production. In a private equity firms´ portfolio, a company acquisition (investment buyout) is equivalent to an addition to a stock of financial assets and the investment buyout demand is generated by expectations on the extraction of short-run cash-flows, mainly anticipated dividends and non–equity based fees. Besides the payment of no –equity based fees, a higher debt ratio to improve short-term cash flows could increase the private equity firms´ investment returns before selling the portfolio companies three to five years later, either publicly or to another investor. Among the private equity strategies, the exit ones become crucial in the investment (buyout) decision because the search for liquidity shortens the maturation of investments. The target is to sell the companies three to five years later after the takeover, either publicly or to other private investors. Although these institutions hold illiquid assets (companies), managers are used to continuously re-evaluate the portfolio assets. In short, after the 1970s, the reorganization of the markets at the global level has been overwhelmed by the financial logic of investment in a setting characterized by expansion of credit, capital markets' operations and institutional investors.

The new trend towards corporate diplomacy puts in question the dominance of a business culture based on short-term profits. Indeed, the shift towards a corporate diplomacy business model aims to manage potential conflicts between stakeholders, that is to say, the potential tensions between short term and long term business strategies.

3. New commitments in global business

The challenges—and risks—in this transition to a business model focused ion stakeholders are enormous. For many of the companies this will require a redefinition of policies, strategies, revenue streams, products and services. These trends suggest new concerns on market competition and global trade. Indeed, the global network of interactions between shareholders and stakeholders has potentially wide and indirect influence on the evolution of the global future of investment,

production and employment. In many cases, this will involve new patterns of growth, energy and technology.

Placing the outcomes of the 2008 global crisis in a long-term perspective, we are living under "the end of normal" since the challenges for actual growth have become deeper. Among those challenges, James Galbraith [13] highlights:

- "Secular stagnation" has lowered the level of potential output and dampem potential growth.
- The nature of technical change seems to negatively affect output growth and employment levels since it is labour-saving.
- Energy markets remain both high cost and uncertain.
- The private financial sector has ceased to be a driver of growth.
- The world order is no longer under the effective financial and military control of the United States and its allies.

In this scenario, how is the corporate diplomacy business model engaging in the "new normal"? How are corporate diplomats adjusting to this "new normal"?

Considering that the conceptualization of resilience has been reframed in terms of flexible adaptation to turbulent and unpredictable market dynamics, corporate diplomats have displayed resilience in a time characterized by slow global growth. They are getting more proactive in pursuing new policies:

- Socially Responsible Investing (SRI), that is to say, avoiding transactions with companies with negative screening according to defined ethical guidelines
- Environmental, Social and Governance Investing (ESG), that is related to the selection of investments after considering environmental, social and governance factors
- Impact Investing that refers to investments structured in order to prioritize social or environmental factors, against financial returns.

To achieve these targets, some strategies have been adopted:

- Active portfolio management in searching promising companies
- Risk management to face new challenges in the good and services markets
- Organic growth
- Expansion through add-ons to add smaller firms acquired at lower prices.
- Adoption of a long-term perspective in fund-raising and investment in order to search for stable and low-growth assets, extend the holding period of investment and, therefore, increase the value creation for the stakeholders.
- Increase board representation and decision rights to influence the company's investment flows and strategies.
- Adoption of inclusive strategies

In short, corporate diplomats cannot be committed to old management habits. Today's new technologies transform commercial capabilities (Big Data, CRM data, social media platforms). Technology transforms the business scenario as the result of the diffusion of new practices at the micro-level. Focusing on cut reduction and underestimating a company's exposure to technological disruption is certainly a wrong strategy. In other words, the current business scenario required the rebuilding of strategies to modernize commercial capabilities and management profiles. In this new management scenario, corporate diplomats should focus:

- on what the company does: customer and channel engagement, operations, products and services.

- how the company delivers: platforms and partners, data and analytics, and operating model and people.

What is at stake is the ability of corporate diplomats to enhance profitable organic growth that requires the identification of the vulnerabilities in a scenario where the digital economy is transforming how companies identify, understand and serve their customers.

In this context, how competitiveness and productivity have been put together in the attempt to promote better performance under the corporate diplomacy model? Corporate diplomats require new tools and lenses to understand how technology affects industries, consumer products companies, distributors, equipment manufacturers and many other businesses. Among current digital strategies:

- Development of networks of internet providers, advanced analytics or digital partners, specific to each sector, that can provide a foundation of digital support for portfolio companies;

- Expansion of centers of excellence to provide solutions or best practices in areas like digital marketing or social media;

- Expansion of connections to outside digital thinkers who can provide new perspectives on digital trends;

- Development of better communication with stakeholders to explain how major technology trends affect various industries.

The digitization of the economies is also affecting the future of fundraising. It is worth remembering that in the last ten years, mainly after the 2008 global crisis, the increasing digitalization of financial transactions is also related to changes in financial competition on behalf of the expansion of the new non-bank competitors called fintechs, especially since 2010, has revealed a new articulation between finance and technology. As a result of the advance of fintechs, big banks have begun to establish collaborative partnerships with them in order to produce new technological solutions in the areas of payment systems, insurance, financial consultancy and management, besides digital currencies. In this digital environment, new technologies – such as advanced analytics, blockchain, big data, robotics, artificial intelligence, besides new forms of encryption and biometrics – have enabled the provision of innovations in financial products and services that could challenge current central banks' patterns of policy and regulation. In fact, there is still a lot of uncertainties in a context where, for instance, EU regulators have adopted a rather passive approach with messages to caution firms and investors. However, since the year of 2017, the

interest in cryptocurrencies and related digital assets has been increasing. Crypto assets have also been considered as an alternative through the venture capital sector despite concerns about anonymity, price volatility, liquidity and transparency. The expansion of the emerging cryptocurrencies includes:

- Building models for the valuation of these alternative assets.
- Creation of data services regarding cryptocurrencies.
- Regulatory frameworks to enhance a well-connected market structure.
- Development of new instruments to operate digital networks.

Indeed, corporate diplomacy takes part of the "new normal" where analytics and big data tools, among other innovations, are being used to build strategies within a digital ecosystem that might include an internal team to manage the ecosystem.

Moreover, climate change is other driver of management transformations. In 2030, global greenhouse gas emissions could be between 13 billion and 15 billion tonnes higher than the level required tokeep global warming within 2 degrees Celsius. Indeed, policy makers are currently at pressure to make progress since it is urgent to limit the global temperature increase to 1.5 degrees Celsius. In this attempt, governments should have to reduce emissions of greenhouse gases by around 25 percent and 55 percent lower than 2017 to limit global warming to 2 degrees and 1.5 degrees Celsius respectively.

Considering this background, climate finance can be a tool to accelerate effective de-carbonization of the economy by means of (a) progress on energy efficiency, (b) de-carbonization, (c) electrification carbon capture and storage, (d) afforestation and reforestation. Overall, global and local investments in electricity continue to fall far short of what is needed to close the energy access gap. In terms of technologies, more than half of total amount of finance committed to electricity in 2015–2016 was related to renewable projects, mainly on-shore wind and solar panels. Although there has been a huge amount of investment in renewable energy technologies, the scaling up global investment requires declining prices for renewables.

Climate finance refers to financial resources invested in mitigation and adaptation projects through financial instruments including loans, grants and guarantees. Today, restructuring energy policies to face climate change require comprehensive solutions in order to include issues related to regulation and finance, technology and innovation, governance and politics, besides environment and social inclusion. The results of global negotiations highlight many challenges to decarbonize the economies. First, there is the climate finance challenge as private actors are the main actors of the investment process while the governments lead the climate change negotiations. Second, there is the educational challenge both between children, young people and professionals to face the requirements to improve teaching practices towards the environment and disaster risk reduction. Third, there is a mismatch between the actions of the ministries of environment and the ministries of economy and finance all around the world. Indeed, global negotiations reveal the lack of articulation between governments and the private sector in order to promote changes in investment patterns and to face education challenges towards a green economy.

The articulation of corporate diplomacy with innovations in climate finance might be consistent with 2-degree pathways. Considering the global investment landscape, the case for climate action has never been stronger it is a must to examine carefully this important aspect of our real economies in a way that leads to a better

understanding of the current role of corporate diplomats as energy investments have been increasingly tied to the private sector. As a result, investment banks, asset managers, investors and managers have key role in the diversification of energy investments. Regarding private climate finance, investment projects oriented to adaptation and mitigation have been locally financed by private resources. Taking into account this background, which are the challenges for private equity investments in energy projects in the near future to cope with the Paris ambition?

Today, comprehensive solutions are required to consider regulation and finance, technology and innovation, governance and politics, environment and social issues. There is the need to overcome the lack of articulation between governments and the private sector so as to promote changes in investment patterns. In this attempt, corporate diplomacy can fill the gap and follow some guiding principles:

- Commitment to face global warming;
- Proactive options (mitigation) must be combined with plans to live with the consequences of global warming (adaptation);
- Allocation of resources in global trade must support sustainable growth strategies and human security.

In short, the perception of a trade-off between good ESG practices (environmental and social governance) and financial performance is being replaced by new business strategies lead by corporate diplomats. A business sector is a living organism whose ethos is the result of a complex combination of customs, norms, beliefs, habits. Changes in business conventions towards responsible investment rely on norms, expectations and actions that could favor long-run investments with inclusiveness. The search for responsible investment should not be separated from sustainable social and economic development. Responsible investment should be a key feature of the reorganization of social interactions since it related to the creation and adoption of guidelines towards ethical practices in business culture. The aim is to modify the relationships among stakeholders, that is to say, among investors, managers, employees, clients, communities and governments.

4. Corporate diplomacy as a tool to improve global governance: key findings from the Brazilian business scenario

Considering the global trade flows, we can now present the general features of the Brazilian business scenario case study based on a sectoral initiative in the context of COVID-19 that influenced the flows of global trade.

The research and analysis of the business scenario was guided by some questions, such as: evaluating the objectives and concatenating the outcomes in order to see the feasibility of the sectorial initiative. According to Godet [14], a scenario describes a future situation and the routing of events that allow movement from the origin situation to the future situation. Indeed, the corporate diplomat must steer the company into the future. To do so, it is necessary to rely on scenarios that include information about key stakeholders, such as competitors, clients, non-governmental associations, foreign governments and national governments, multilateral institutions. The goal of scenario development is to systematize changing trends and analyze the most likely alternatives in order to outline strategies and move towards the desired future. As the future is not completely predictable, there is always a degree of uncertainty in the analysis of business scenarios. At this

Stakeholder	Main interest	Level of Influence	Key Strategy
Corporate diplomats of companies	Normalization of global trade	Low	Elaboration of a sectorial proposal
ABIHPEC	Normalization of global trade	High	Elaboration and negotiation of sectorial proposal
Ministry of Economy	Domestic supply	High	Diplomatic conflicts with China, aligment with the United States.

Source: Elaborated by the author.

Table 1.
COVID-19: Stakeholders and strategies within personal hygiene and cosmetic sector.

respect, it is worth noting that Porter [15, 16] considers that scenarios are views of future reality based on a set of plausible assumptions that take into consideration significant uncertainties that may influence the market evolution. Under the corporate diplomacy perspective, the understanding of the opportunities and threats that might arise from different business alternatives aims at facing factors that may affect the business performance and the decision making process [17].

In Brazil, the role of corporate diplomacy as a business tool of governance to defend sectorial interests within the personal hygiene and cosmetic sector was crucial in the context of 2020. After the outbreak of the pandemics, this sector was deeply affected by the lack of raw materials due to restrictive measures that countries, mainly China, implemented to protect the domestic markets.

In the context of the pandemic, corporate diplomats within the personal hygiene and cosmetic sector working together with the Abihpec, the Brazilian Association of the Personal Hygiene and Cosmetics Industry, monitored all legislation and specific norms applicable to global trade in order to favor the evolution of the industry in a context where the lack of raw materials, the high cost of freights and the devaluation of the Brazilian currency were relevant threats for the business performance.

The sectorial initiative tuned out to influence the decisions of the Ministry of Economy concerning foreign trade decisions. In other words, the impacts of the pandemic related to disruptions in the Brazilian flows of global trade that affected the personal hygiene and cosmetic market were circumvented with the support of corporate diplomats, under the leadership of the Abihpec, in negotiations with the Brazilian Ministry of Economy [18–20]. It is relevant to highlight that, after the outbreak of the pandemics, the Brazilian government has not avoid diplomatic conflicts with China. As a result, the role of corporate diplomats has been outstanding to enhance the normalization of global trade related to personal hygiene and cosmetic inputs and products. In fact, the corporate diplomacy as a tool of governance turned to prove that the Brazilian trade flows could warrant the supply of raw materials and finished product for the local population within the personal hygiene and cosmetic market. **Table 1** summarizes the stakeholders´ map.

5. Conclusions

After some decades, it is a reality that global market deregulation has broadened the gap between business dynamics and the role of governments to favor global trade. Regarding global trade, corporate diplomacy is a tool of governance oriented to address business challenges and entail corporations to create, enforce, and change the rules that govern business conduct. Indeed, at the heart of the negotiations, corporate diplomats keep the focus on global integration.

The relevance of the role of corporate diplomacy in promoting economic and social development through the benefits of new strategies and practices has been deepened in the aftermath of the coronavirus crisis. Considering the Brazilian global trade challenges, the participation of corporate diplomats turned out to create sectorial strategies to enhance the normalization of global trade related to personal hygiene and cosmetic inputs and products, mainly with China.

In light of this, the recommendations, from the perspective of corporate diplomacy, include three pillars: political dialog, business cooperation and free trade. The ever-changing international business environment puts pressure on new companies' capabilities to update on trade negotiation practices. In this sense, future research on business strategies should delve into the alternatives to overcome commercial, financial technological and cultural barriers [21]. In this attempt, corporate diplomats might help to shape global business solutions to complex problems.

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Chapter 8

Define the Process of Human Resource Integration in Cross-Border Acquisitions: Evidence from Chinese Oversea Acquisitions

Wenjia Chang-Howe

Abstract

This research focuses on integration during and after mergers and acquisitions where one firm (Chinese) has a dominant position in comparison with another (Western firm). Using the critical incident approach, 30 interviews were conducted with representatives of 13 firms that have undergone Chinese-Western mergers and acquisitions (M&As) during the period from 2005 to 2019. This study aims to analyse the HR integration process in pre-and post-acquisition to determine the critical success factors, and present a framework that determines the success or failure factors and the actions required. The findings have important implications for an organisation post-acquisition phenomenon from a human resource point of view. As a result, it presents an overview of this critical post-HR integration phenomenon and posits that using an integrated approach from the human resources perspective is essential to ultimately enhance the acquisition integration success rate.

Keywords: Post-M&As, Human resource integration process, Critical incident approach, HR Integration

1. Introduction

Although 80% of mergers and acquisitions (M&As) results are reported as failures based on the desired profitability [1, 2], M&A is still one of the most essential methods for an organisation to quickly attain corporate growth in order to gain market share or achieve synergies and innovation [3]. As M&A activities continue to rise, 'human factors' are often blamed for disappointing M&A outcomes. A substantial body of literature has examined various facts of the integration models and HR issues [4, 5]. In particular, HR is recognised as one of the critical factors after the M&A period (post-M&As) for success or failure outcomes [6–9]. However, research in this area is more focused on emotive moments in the initiation of M&As [10], little research literature has looked at post-integration from a human resource (HR) process perspective [11].

Chinese overseas mergers and acquisitions (M&As) have a relatively short history [12], beginning with the Go Global policy in 1999 [13]. The golden age for Chinese-Western M&A deals was made between 2005 and 2017 [14], after which the

Chinese government changed its policies on overseas investments, and M&A activity dropped dramatically. There was significant interest among Chinese companies to acquire the advanced technology used by Western companies [15], along with their more modern management systems [16, 17], market resources, and innovation capacity [13]. High-income countries, particularly those of North America and Europe, attracted 65.6% of Chinese foreign direct investment outflows during this period [18]. However, only a small amount of these outward-bound investments by Chinese firms has shown successful performance after the M&As. [19–22].

Very few studies have examined integration during and following Chinese overseas M&As [23], and they lack a clearly defined process or an overview of content involved in this important phenomenon [24]. Further, a consistent perspective regarding the human resource integration process (HRIP) is absent as are the interaction steps. While most studies on M&As consider the human factor critical for integration [24], few scholars have considered HRIP as a dual process that is undertaken simultaneously with integration as a whole. This study focused on the Chinese -Western overseas M&As, posits that complete integration is necessary for practitioners to realise more successful merger outcomes [25]. It propose to answer the critical question: What is the HRIP and what factors should be incorporated into the HRIP after cross-border M&As?

In order to perform the investigation over post-M&A integrations, where one firm has a dominant position over the other, and simplify the interactions and process [26]. Thirty interviews were conducted using the critical incident (CI) approach [27], with representatives of 13 Western firms acquired by Chinese companies during the period from 2010 to 2016 (including the Netherlands, Germany, United Kingdom, Canada, and Australia), to understand the process. Secondary data from newspaper articles, internal HR policies, and managerial documentation were also reviewed.

This study makes two main contributions to the field of interests. The first is to analyse with preliminary information from selected companies the HR integration process through integration leadership, change and restructuring, personnel resistance, and valuable personnel retention factors. This process influences the success or failure of the M&A integration stage. The second contribution is to present a framework that can determine the success or failure factors, the actions, and some examples of HR management and behaviour during the M&A process. This study focuses entirely on Chinese overseas M&As, where a business from an Eastern culture enters a Western culture environment. Therefore, the scope is limited to predefined national characters, and does not exhaust all possible types. A discussion of the validity of the proposed framework in other contexts is also presented in this paper.

2. Literature review and selection

Following Pablo's [28] definition of integration, HR integration can be defined as the post-M&A change in an organisation's technical, administrative, and cultural configuration [11]. Many studies have addressed the causes and outcomes of HRIP, and some studies have also focussed on the integration of HR management practices [11, 25]. For instance, the failure to find consistent relationships may stem from an over-emphasis on either the pre-M&A stage (characteristic of early research in strategic management) [29], the post-M&A stage (a focus of early cultural studies) [30], and strategic management research at the expense of the interconnection between the pre- and post-M&A stages [31, 32].

The integration of organisations is the process by which two companies are combined after an M&A is announced. Often, the degree of interaction and strategy between the two companies is defined before the integration begins [33]. Therefore,

the decision-making process for HR factors in the pre-M&A stage is critical in understanding the integration process [34]. Following the literary traditions on human factors in post-M&As, four central themes have been studied: leadership [33] and the integration team [35]; change [36] and the restructuring process [37]; personnel resistance [3]; and valuable personnel retention [38].

There are few systemic or structured methodological frameworks available for the study of integration itself [25]. Although several researchers have focused on a process approach [39–42], this perspective has not been widely taken up as anticipated. For example, Caiazza and Volpe [43] proposed a three-staged integration process: a multi-level due diligence negotiation, an organisational culture integration, and atmospheric competences [43]. Steigenberger [38] presented an integrative framework of the general process of business integration in an M&A, which underlines the interactions between the conditions and interventions that are critical for understanding M&A outcomes. Advocates of a process approach have focused on post-acquisition management rather than examining linkages throughout the entire M&A process [39, 44]. A multidisciplinary review is needed to examine all of the critical variables that appear throughout the M&A process. While some resources are considered prerequisites for the development of a firm, such as absorptive capability [45] and integration capability [35], two critical dimensions identified by Haspeslagh and Jemison [39] are essential: the need for strategic interdependence and the need for structural autonomy [46]. Gomes and Angwin [47] summarised the critical success factors for the pre- and post-M&A phases and their inter-relationships. Furthermore, no clear linkage between the steps of the post-M&A processes and human factors has been established [48].

Most studies have investigated the human side of M&As by focusing on influential human factors within organisations [45]. These include cultural fit, the relationship between management styles, cultural tolerance, and stress-related emotions experienced by employees during and after an M&A [49–52]). Other works have investigated the importance of managerial practices, such as cultural learning interventions and communication initiatives [53, 54]; openness and willingness in leadership [55]; and transparency to trust between the acquirer and the employee [56]. Although integration of human resources is important, there is a dearth of studies on HRIP practices during M&As [32, 57, 58]. Further, the current understanding of when and how human resource integration leads to cross-border acquisition success is limited and extant literature does not investigate remedies for conflicts in cross-border acquisitions.

In this study, the link between the structural, processual, and strategic dimensions of integration is also expressed through the use in the strategy literature [59–62]. Integration's strategic dimension influences its structural dimension and specifies the direction for its processual dimension. Granlund [63] also suggests that structure and action are inseparable in post-merger integration (PMI). **Table 1** presents an overview of leading theories related to post-M&A HR integration taken into consideration during this study.

Despite the diverse methodologies used by the studies reviewed, elements related to integration were identified in relation to the three stages of the M&A: the pre-integration stage, the integration stage, and the evaluation stage [39]. A conceptual framework for post-M&A HR integration was proposed by Chang-Howe [99], which categorises the HRIP from pre-integration (HR due diligence and determining the factors of an integration strategy) to HR integration (system integration, personnel integration, and change management) and integration outcome (success and failure indicators). It offers a clear overview of all tasks and discusses HR functions in an M&A, however, the interactional relationship between the stages remains unclear.

This study posits that a more integrative approach is required. Therefore, introducing a design management control system [97] to design a human resource intergration process (HRIP). The post-M&A HRIP can be understood as a performance management control system for the combination of two existing HR systems

Stage of integration	Criteria	Human resource factors	Citation
Pre-integration	Define HR integration strategies	Competitive advantage resource analysis	[64–66]
		Knowledge-based resource;	
		Resource-based view	
		Gap analysis	[67–78]
		Culture fit	
		Organisational culture assessment	
		Cultural distance	
		Cultural clash	
		Work alienation	
		Integration capabilities Internal capabilities resources (if key personnel are available)	
		Organisational constraints (union, policies, pension, contract, and change management)	
		Legislation in the acquired country	[79–84]
		Institutional theory and institutional constraints (internal and external legitimacy, liability of foreignness, and institutional dualism)	
		Employment system, economic organisation and control, corporate governance regimes	
	Choose the type of methodology	Acculturation modes (interaction, assimilation, separation, and deculturation)	[85, 86]
		Acculturation modes (infusion type, interactive amalgamation type, and independent type)	[87]
	Define the level of HR integration	Overall integration (procedural integration, physical integration, managerial integration, and sociocultural integration)	[88]
		Continuum from autonomy to absorption	[89]

Stage of integration	Criteria	Human resource factors	Citation
Integration (execution)		System integration	[11, 25, 46]
	HR management philosophy and system (acquire directly or recruit new employees; agent-type integration)	Integration of HR management practice (deletion, adoption, and maintenance of HR practices)	
		Knowledge transfer and the learning process;	
		Personnel integration	[11, 25, 46, 54, 87, 90]
		Personnel changes	
		(Personnel assimilation mode, manager accreditation system, and changes in managerial positions)	
		Change management	[91]
		Perception of decision-maker	[92]
		Cultural rejection	[93]
Post-integration (evaluation)	Employee retention	Key personnel retention;	[92, 94–96]
		Top management turnover and career patterns	
	Performance evaluation	Opportunistic behaviour (hold-up, shrinking, and free-riding), goal setting, and cultural retrenchment	[97, 98]

Table 1.
Overview of main theories related to post-M&A HR integration.

and two organisational cultures. This management control system incorporates a combination of competitive advantages [30] to maximise outcomes. The methodology used provides a logical workflow for organising and guiding the development of an HRIP [100]. The most important considerations for an HR management system in M&As are the level and speed of integration [41], and HRIP should be assessed with the post-merger concepts of integration strategies [50], integration planning [18], resource-based theory, and institutional theory [71, 72]. These key elements provide the content for the framework that will be used to develop the HRIP in the sections below. Previous studies on M&A integration do not differentiate between post-merger and post-acquisition integration, therefore, we employ the neutral term post-M&A integration [48].

3. Methodology

3.1 Research design and qualitative method

Three primary interviews were conducted at random with specialists from Chinese M&A consulting firms and investment banking firms. Using the data from these interviews, the potential M&A cases were selected and designed in the

interview questions. The samples chose from commercially oriented companies since their segmentation toward business activities would have considerable similarities. These organisations feature a diverse collection of occupations and functions that show differences in the nature of work and the social context in which it is done [101]. To keep the sample concentrated and absolute, mergers and joint ventures were excluded from the study.

Companies were selected from five Western countries, the Netherlands, Germany, United Kingdom, Canada, and Australia. The Critical Incident (CI) approach [102] was used to collect primary data on the levels and patterns of post-M&A HRIPs. The interviewee's experience during the M&A was used to identify critical events and the processes and challenges met within the course of the M&As [103].

Contact was made with managers through professional and personal networks, and the sample was populated using a snowball approach. The sample was limited to those to whom the best access was possible and 30 interviews were conducted with representatives of 13 privately owned companies during the period from 2017 to 2020. The companies represented sectors such as manufacturing, entertainment, energy, finance, mining, and insurance. Interviews were concentrated on individuals in top management roles or who were critical to the M&A integration.

3.2 Data collection and analysis

3.2.1 Sample and context

HR integration is usually quite time-consuming, ranging from three months to two years. To collect relevant information and follow the development of cases, multiple interviews were conducted with the interviewees over the period 2017–2020. Six interviewees were transferred back to China after the integration, and four of them transferred to another location. The interviews were conducted in China, the Netherlands, United Kingdom, France, and Germany. In ten cases, interviews were conducted over the telephone, and the others were through face-to-face meetings in the country where the interviewees were located.

The interview questions were drawn from the literature on PMI, using the definitions of HRIP and patterns of HRIP from Yan [11]. The interview questions were developed in greater depth to identify and illustrate processes and critical factors in PMI. The questions covered the following topics:

- The general process of HRIP in the company and the parties involved.
- Exceptional events that occurred during the HRIP, as recalled by the interviewee.
- Emotions and personal experiences related to these events, in particular, the reasons for the emotions.
- Comparison of those experiences with other aspects of the interviewee's professional life and knowledge.

The participants were approached with carefully designed, open-ended questions. The interviews began by asking them to describe their work, responsibilities, and duties within the organisation, to examine their self-awareness in relation to their work and to confirm their rank. We then enquired about their knowledge of post-M&A management. Further, we explored the interviewees' emotions regarding post-M&A integration and their experience in the HRIP by using backtrack

questions that explored sections of time. This sample and context provided an excellent opportunity to examine key events and integration challenges in acquired Western organisations.

3.2.2 Data

This study followed the grounded theory approach [104] to collect the data in stages. The primary data were gathered using semi-structured interviews. Then, by adopting content analysis, we structurally analysed the interview records to discover the specific HRIP used during the post-M&A activities. Three additional interviews were held with management consultants specialising in M&As, in the early and later stages of the research to determine whether management behaviour patterns were unique or common.

Table 2 presents the characteristics of the positions held by the participants, industry sector, interview years, and other information. The final 30 candidates were selected using the criteria of position and management experience. Interviews were performed within and outside the company and lasted approximately 1 hour on average [105]. Personal information was kept confidential, and the data were stored anonymously [106]. Although we modified the interview protocols during each interview to take advantage of emerging themes [107], each set of protocols included questions on each member's perception of his responsibility, management experience, leadership style, the experience of the HRIP, and experience in managing conflicts and difficult emotions in the M&A process. This set of questions allowed the similarities and differences among members' perspectives to be observed.

3.2.3 Data analysis

Iterative analysis was performed on the qualitative data, by moving back and forth between the raw data and an emerging theoretical structure [108–110]. Three significant steps are followed in this iteration: creating provisional categories and first-order codes, integrating first-order codes and creating theoretical categories, and delimiting theory by aggregating theoretical dimensions [101].

The date employed in the qualitative research software ATLAS.ti, which facilitated the analysis of qualitative data. Interview transcripts were entered as text files into ATLAS.ti and coded. These included phrases, terms, or descriptions offered by the participants, in response to the semi-structured interviews. Open coding (initial coding) [111] was used in the first set of the coding process. Each coder began by reading the transcripts to identify the answers to the given questions, then joint statements were drawn on to form provisional categories. First-order codes and exit interviews were broken into sets of themes, using a strategy called focused coding [111] (e.g. post-M&A HRIP). This stage of analysis allowed a comparison to be made to establish differences between answers on the same topic. Measurements and extensions of critical incidents toward the change from the old to the new employer and the difference in organisational cultures and personal leadership representations were also deciphered. Once these theoretical categories were generated, we looked for the underlying dimensions to understand how different categories fit together into a coherent picture [112]. We formed different conceptual frameworks or models that described the relationship between the themes and available organisational theories. Once we identified a possible framework, we re-examined the fit or misfit of the data with a tentative theoretical understanding (e.g. [104, 108]).

									Interview taken year			
Deal Country	**Company No.**	**Integration strategy**	**Integration result**	**Acquired firm industry**	**Deal Year**	**Participant No.**	**Job Title Acquires side**	**Job Title Acquired side**	**2017**	**2018**	**2019**	**2020**
						1		HR Manager of the acquired company	1st			
	A	Fully integrate	Failure	Heavy vehicle Manufacture	2012	2	Chairman of the Acquired company		1st		2nd	
						3		COO of the Acquired company	1st			
	B	Fully integrate	Failure	Entertainment	2015	4		Head of Youth Academy	1st			
		Partly integrate	Success					General manager of the Acquired company				
	C			Energy	2013	5			1st			
						6	HR Director of Acquirer company		1st		2nd	
						7		Director of Business Development	1st			
						8		Director of Technical Department	1st			
						9	Board member of the Acquirer company		1st			
The Netherland	D	Fully integrate	Success	Electric product wholesale	2005	10		Director of Business development	1st			
						11	General manager of the Acquired company		1st			
						12		Head of Business development	1st			

									Interview taken year			
Deal Country	**Company No.**	**Integration strategy**	**Integration result**	**Acquired firm industry**	**Deal Year**	**Participant No.**	**Job Title Acquires side**	**Job Title Acquired side**	**2017**	**2018**	**2019**	**2020**
	E	Fully integrate	Failure	Electric product wholesale	2011	13	Operational manager				1st	
						14	HRD of the Acquired Company		1st	2nd		3rd
	F	Fully integrate	Success with re-intergration	Insurance	2015	15	CEO of the Acquired Company		1st			
						16		Secretary of the Board	1st			2nd
				Chemical Manufacturer	2016	17	CFO of the Acquired Company			1st	2nd	3rd
	G	Fully integrated	On going			18		Sales director				1st
				Energy	2009	19	GM of the Acquired Company				1st	
	H	Fully integrate	Success			20		Office manager				1st
	I			Entertainment	2016	21	HRD of the Acquired Company				1st	2nd
Germany		Fully integrate	Success with re-intergration			22		Director				1st
						23	M&A manager				1st	
	J	Fully integrate	Failure	Electric product	2017	24		Project manager				1st
	K		On going	Payment	2019	25	HRD of the Acquirer Company				1st	2nd

									Interview taken year			
Deal Country	**Company No.**	**Integration strategy**	**Integration result**	**Acquired firm industry**	**Deal Year**	**Participant No.**	**Job Title Acquires side**	**Job Title Acquired side**	**2017**	**2018**	**2019**	**2020**
UK		Fully integrate				26		Project manager				1st
Canada	L	Partly integrate	Success with re-intergration	Energy	2012	27	M&A				1st	
						28	HRD of the Acquire Company					1st
Australia	M		Success with re-intergration	Mining	2016	29	HRD of the Acquire Company			1st		
		Fully integrate				30		HR manager of the Acquire company		1st		

Table 2.
Participant sample.

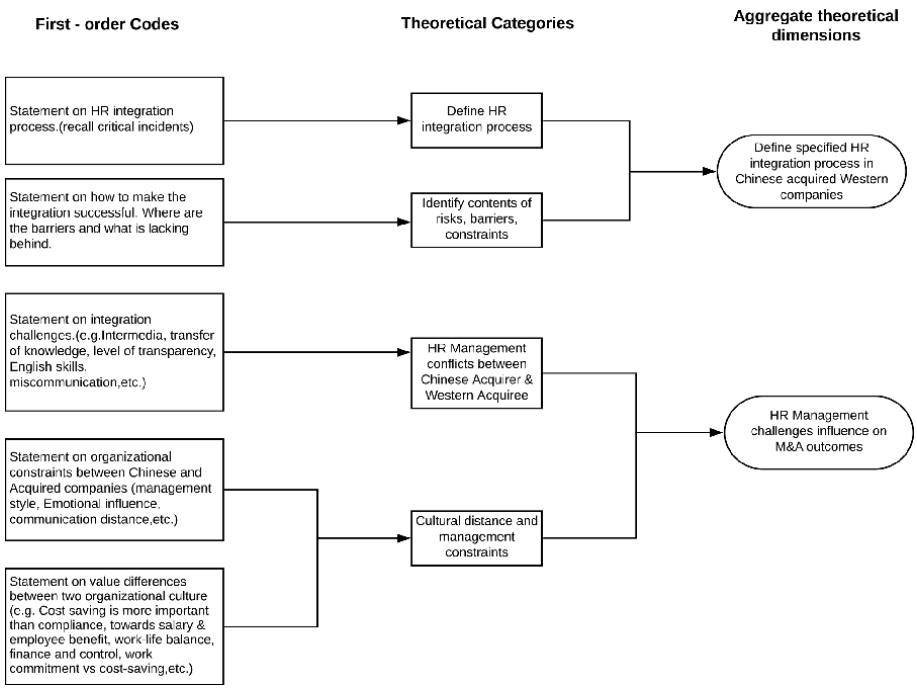

Figure 1.
Overview of data structure.

Figure 1 summarises the process, using Corley and Gioia's [10, 113] data structure, which presents first-order categories, theoretical categories, and aggregate theoretical dimensions. The aggregate theoretical dimensions shown are the ones that best explain the critical indicators that influence successful outcomes and employee emotions in HRIPs.

The rest of the manuscript discusses the findings, followed by a discussion on the process and constraints identified in the HRIP. We also propose a general theoretical model of HRIP as well as culturally specified values and attitudes that influence successful outcomes during post-M&A integrations. This research concludes with the discussion of the implications of the model, both in theory, related to HRIP and critical factors [114].

4. Findings

Following the fundamental argument of Jemison and Sitkin [40], M&A should be seen as a process with distinctive characteristics, which can affect important organisational activities and outcomes [100]. The results in the qualitative phase were divided into three significant steps: pre-integration (i.e. HR due diligence, choice of HRIP, and integration strategy), integration (i.e. systems integration, personnel integration, and change management), and evaluation (i.e. designed outcome and inconsistencies). As expressed by one interviewee 'Each company has its own story, but overall, the problems are the same. First, you need to analyse what is there and what the priority is, and then what can be done' (Participant 13). The combination of results of the current research with existing literature led to the development of the post-acquisition HRIP framework (**Figure 2**), which incorporates the HR integration strategy, HR system integration, personnel integration, and change management (**Table 3**).

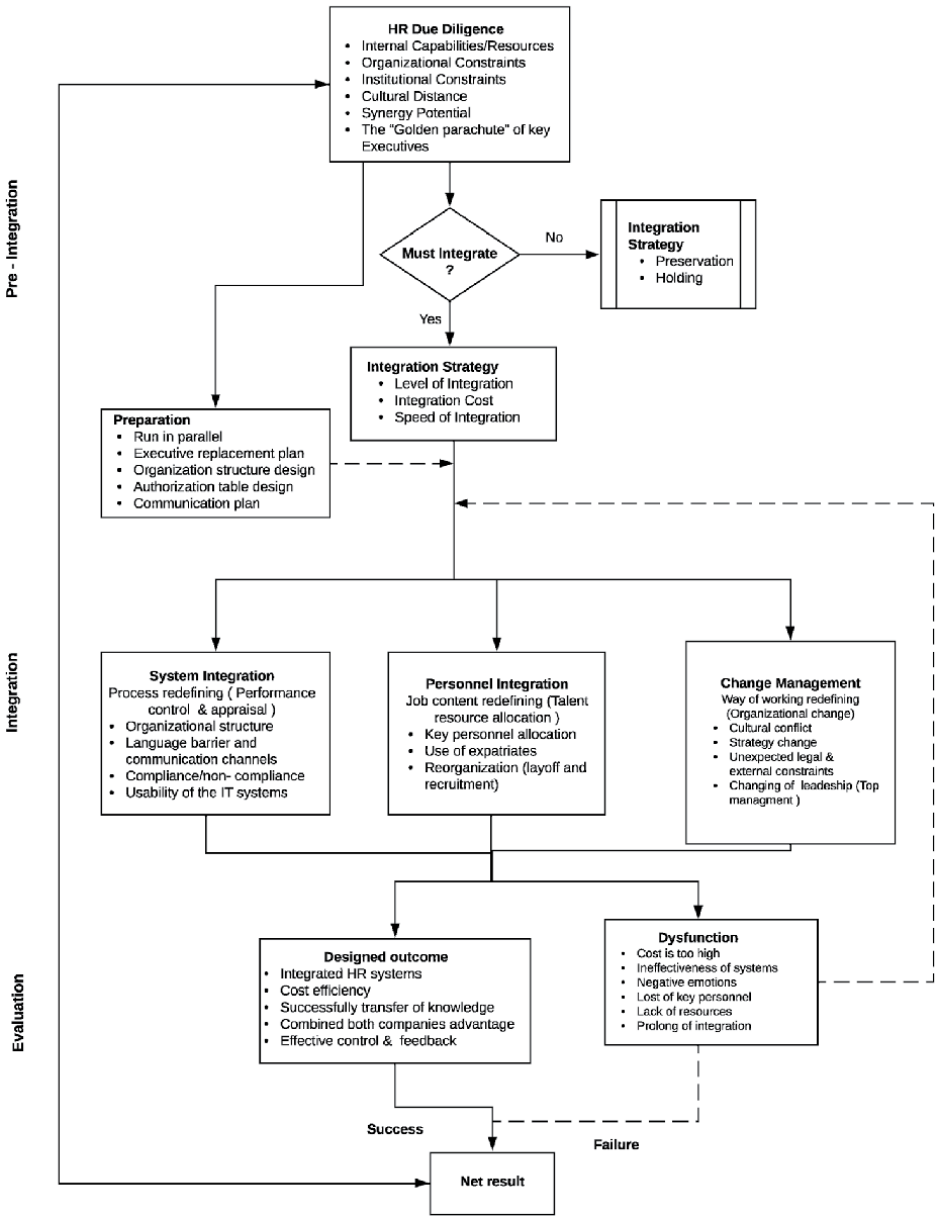

Figure 2.
HR integration process (HRIP).

4.1 Pre-integration (HR due diligence, choice of HRIP, integration strategy)

Chinese firms tend to invest overseas, in countries with higher incomes, better technology, and advanced management methods [18]. In particular, Chinese companies that pursue M&As with Western companies seek to acquire knowledge, skills, and capabilities to enhance their competitive advantage, to enter Western markets. Therefore, the level of integration can be determined, depending on the absorptive capability of the acquiring company.

The pre-integration phase, took place in three steps, based on the findings: due diligence, HR analysis derived from broader business analysis, and HRIP strategy and planning.

	Theoretical categories	Codes and interviewee numbers
Pre - Integration	**HR due diligence**	
	Internal capabilities and resources Organisational constraints Institutional constraints Cultural distance synergy potential The golden parachute of critical executives	To define the internal capabilities of the acquired company well and understand what available resources you have within your own company. (Nos. 15, 19, 27) The key points for HR due diligence are to determine what structures and risks the acquired company has and whether there are any compliance issues. (Nos. 27, 28, 29, 23, 17, 14) We overlooked the legal and government policies that impacted our deals. (No. 4) For Chinese companies, especially state-owned ones, government policies have a great impact on decision making. (Nos. 2, 27, 28, 15) We assess the acquired company to seek synergy potential. (Nos. 28, 24, 23, 21, 19, 15, 9) Cultural assessment and determination of cultural distance is critical during the HRDD process. (Nos. 14, 27, 21, 25, 23, 27, 29) The directors in the target company have already signed off on highly paid and well-protected exit clauses before the sale, or golden parachutes. (Nos. 27, 23)
	Integration strategy	
	Level of integration Integration cost Speed of integration	Integration can last from three months to two years. (Nos. 27, 23, 29) Determine how much effort you would like to put in and how much time you have. (Nos. 14, 21, 23, 27) How deep do you need to go and how many people need to be integrated? (Nos. 28, 29, 21, 14)
	Preparation	
	Run in parallel Executive replacement plan Design of the organisational structure Authorisation table design Communication plan	For HR, the work begins before the deal is made, and we run in parallel with the acquired company to prepare the transition. (Nos. 28, 25) Many plans have to be made in a limited time frame, including those for the organisational structure, the talent map, the authorisation table, and the communication plan. (Nos. 6, 14, 21, 23, 25, 27, 28)
Integration	**Systems integration**	
	Organisational structure Language barrier and communication channels Compliance/non-compliance Usability of IT systems	The organisational structure was redefined. (Nos. 21, 19, 25, 28, 29) Language (English or Chinese) often caused difficulties. (No. 7) There was no English version available in the internal system of the acquired company. No one expected that. (No. 15) The two ERP systems were just not comparable. (No. 3) I did not think compliance would be such a big issue. (No. 17) Performance control, resetting target and goals. (Nos. 21, 28)
	Personnel integration	
	Key personnel allocation International transfer (work	People from the HQ were sent to the acquired company for key positions, for example: CFO, CEO, HR, and technical positions. (Nos. 2, 3, 4, 7, 8, 12, 16) Work permits are often difficult to arrange for overseas Chinese

	Theoretical categories	Codes and interviewee numbers
	permits)	managers. (Nos. 20, 30, 16, 6).
	Reorganisation (layoff and recruitment)	Layoffs were the number one task after the M&A, we had to let people go. (No. 28) Key positions need hiring, and we need fresh minds and talent for the new organisation. (Nos. 14,15, 21)
	Change management	
	Cultural conflict Strategy change Unexpected legal & external constraints Unexpected delay of international transfer of key personnel	If one phrase is used to describe HR integration, it would be change management. (No. 28) The English of some Chinese colleagues is really not good. I cannot understand them. (No. 4) If all internal communication between Chinese colleagues is written in Chinese, we may feel left out. (Nos. 7, 12, 18, 22, 26) The decision-making process is quite one-way, and there are often significant cultural conflicts between Chinese and Western workers in relation to decision making and trust building. (Nos. 3, 1, 7, 12, 18, 22, 24, 26) The strategy of the company has changed over time. (No. 28) To survive, you will need for the company to become accustomed to the Chinese way of doing things. (No. 30) No one expected that the union would say no. (No. 4) We waited four months for the new CEO to arrive, but his visa was delayed. (No. 30) The HQ must decide whom to send over, and the key contact person changed a few times over three years. (No. 21) The person who was needed is pregnant. (No. 25)
Evaluation	**Designed outcome**	
	Integrated HR systems Cost efficiency Successfully transfer of knowledge. Combined both companies advantage Effective control and feedback	It took us two years to integrate the two HR systems into one, it but functions pretty well now. (No. 14) The cost is much lower, and overhead costs are much more efficient. (No. 21) We set up a sharing platform and internal transfer systems for people to transfer between the China HQ and overseas locations. (Nos. 17, 11, 2, 21) Resources and talents are shared with HQ and worldwide, and we integrate the acquired company into our global scope. (Nos. 25) The internal system is linked, and the dates and results, as well as performance, can now be easily seen. (Nos. 18) We set up a clear communication and control channel to allow the employees to talk to us and get feedback, and the engagement is much higher than before. (No. 21)
	Dysfunction	
	High cost Ineffective systems Negative emotions Loss of key personnel Lack of resources Prolonged integration	Money was an issue; we needed have to wait until the Chinese manager made a decision. This is difficult sometimes for a Dutch company. (No. 4) Do we have qualified people or not? The financial manager they sent should be able to take responsibility. (No. 3) Chinese HR managers think trust issues during the HR integration process are not much of a problem. (Nos. 2, 6, 22, 29) We had three CEOs in two years. (No. 21) Almost all directors have left the company. (No. 28) Due to the current situation, we need to let the company run on its own for the time being. (No. 25)

Table 3.
Coding results: Contents and processes of HR integration.

> *"For mergers, there are two important issues. First, due diligence, and second, how to deal with current employees. Normally, business negotiations around the merger include personnel issues. Therefore, before integration starts, HR should already be involved. The moment of involvement should be before the merger. Involvement after the merger is dependent on the strategy before the merger." (Participant 6)*

According to Jansen and Groot [97], the management control cycle begins as soon as a control problem occurs and continues where there is a mismatch between performance and results. This identifies the nature of the poor fit between the acquired and acquiring companies. This may be caused by several factors, such as organisational constraints, cultural distance, and institutional constraints. Factors of this type should be identified during the due diligence process, in the pre-M&A phase, for later use as terminators for the integration strategy (level of integration, integration cost, and integration phase).

During due diligence, risks that may occur in the M&A should also be identified. Once a risk is identified, methods of control should be chosen. Such methods should answer two questions: Should human resource management be integrated? and to what level should it be integrated? If integration is not necessary, an autonomy-based style of integration strategy should be chosen (i.e. preservation or holding).

> *"HR planning [for this] is quite simple, requiring only an organisational chart and a match between headcount and positions. Organisational chart depends on business needs. Another important matter is what kind of business strategy should be adopted and what HR arrangement should be used. "(Participant 6)*

The business strategy determines the HR strategy, which leads to an integration strategy. Therefore, the question of whether the company will merge or continue to operate as a separate company is determined by the overall business strategy. HR planning covers the previously identified risks from due diligence.

Once the integration strategy is determined, preparation begins. Often, the preparation will run in parallel with business negotiations and signed deals. 'If you wait until the deal is signed off and then begin to prepare the integration, it will be too late' (Participant 27). 'We need to prepare the plan for the key personnel, who will stay and who need to leave, which will influence the organisational structures and later authorisations' (Participant 14).

Communication plans will only be drawn up after the integration strategy and all other preparatory plans are fixed. 'The preparatory plan is often aided by external consultants, but once the deal is closed, they will leave. You are, after all, left on your own to carry out the integration' (Participant 27).

4.2 Integration (system integration, personnel integration, and change management)

4.2.1 System integration

The acquisition process is so complex that managers often spend most of their time solving issues that were overlooked during the pre-M&A stage. Hence, the integration strategy and day-to-day management could be neglected. 'HR integration begins the day after the deal is signed, and it sometimes lasts two to three years' (Participant 27). Therefore, it is essential to offer a clear assessment of overall integration contents and steps. In this study, data were gathered on three aspects of the redefining processes utilised by acquired companies. Birkinshaw et al. [115] divided the post-acquisition process into task integration and human integration.

During the integration phase, HR integration is implemented through three categories: HR system integration, personnel integration, and change management.

Systems integration concentrates on providing updated definitions for performance control and appraisal. When two existing management control systems need to be combined, or one needs to be replaced, system integration is a necessary step. System integration refers to task integration, which includes redefining organisational structures to fit the new business strategy; compliance checks of the acquirer's internal and external requirements; and integration of two information technology (IT) systems. The findings revealed that for each M&A, the language barrier created a significant challenge between the Chinese acquirer and the acquired company. This includes language clashes in the vital areas of the IT system, internal control systems, and spoken language in the workplace. These language barriers aggravated the challenge of communication, both internally and externally. Participant 3 elaborated on this topic as:

> *"Because the Chinese manager's English skills are poor, I have to hire local assistants to support the work. Additionally, all reports to the HQ are written in Chinese, and communication with external parties has to be translated. Therefore, I have two Dutch financial assistants and two Chinese assistants, and I report every month, where normally I do it only twice a year"(Participant 3).*

4.2.2 Personnel integration

Personnel integration includes changes to personnel in a post-M&A organisation that relates to key personnel allocation; the international transfer of key Chinese staff overseas, trilingual talent recruitment, and redundancy and reorganisation (layoffs). Control problems differ on two axes: the source of the problems may be on the individual or the organisational level, and it might manifest itself in behaviours or ideas [97]. Therefore, to promote integration, the focus should be on behaviours that are related to functional factors, namely, human resource systems and personnel allocation, as well as on ideas related to personal factors, such as emotions and cultures. 'There is still a relationship between a boss and an employee. In fact, the transactional relationship in Western society is the same; only the Chinese understanding hides it more deeply' (Participant 9).

The issues that most often arise from system and personnel integration revolve around the following two considerations: the organisational chart, the design of the organisation's reporting line and the human resource needs based on the chart. 'This analysis includes HR planning, including budgets, headcounts, layoff plans, and so on. If a layoff plan is included, a payoff plan should also be made' (Participant 6). 'The reorganisation of all manager positions merges between departments. If it is a complete company merge, the switch of the employment agreement should be taken into consideration' (Participant 14).

Previous studies have devoted significant attention to the allocation of top management and the shift in organisational culture linked to the CEO's identity, during post-M&A integration [116]. Further, studies have also focused on the impact of succession on organisational outcomes (Miller, 1993; Shen & Cannella, 2002; Zhang and Rajagopalan, 2004). This study found that the stability of new management is essential for the HRIP. Top management, including the CEO, CFO, and board of directors in acquired companies, are often replaced after the acquisition, by expatriates sent from the China-based headquarters, or recruited locally. Sometimes, due to multiple reasons (including change in organisational strategy, relocation delay, personal reasons, cultural misfit, and expectations mismatch), new management do not remain longer than one or two years. Frequent changes in top

management (CEO, CFO, or critical positions within the company) creates management divisions within an organisation. Departments and stakeholders become disengaged because they lose interest in management decisions, and daily operations can progress without consulting them. Divisions between top management and operations limit the rollout of strategic decisions or new policies from the management level to the operational level. Hence, changes in strategy or new management policies are not implemented throughout the organisation. 'Three CEOs remained within two years. Many policies were changed or were not implemented before they were changed again' (Participant 21).

4.2.3 Change management

Management control produces a never-ending loop. Any unexpected incident can, and will, alter the process chosen to achieve the desired outcome. Therefore, change management is the greatest challenge in the post-M&A environment, and requires experienced and qualified human capital to manage the risk and process [117]. 'The challenge for Chinese overseas M&A is how to develop the acquired company in the long term. The sustainability of the company is the most challenging for the Chinese owner' (Chinese corporate owner and roundtable participant in response to the question, 'What is the biggest challenge to managing a Chinese-owned Western company'?)

This research suggests that change management include the following elements: emotional influence, language barrier, cultural conflict, financial change, strategic change, unexpected legal constraint, and unexpected delays in the international transfer of key personnel [118].

> *"In people management, there was not that much influence due to the change. The structure was changed, the structure was implemented in one way, and then I changed it to another way, then I quickly changed back to the first structure because it worked better"(Participant 1).*

Critical events, even if challenging, do not necessarily entail negative outcomes, as such events are recalled as disagreements over practices. Surprisingly, criticism is not usually perceived as having negative effects, but rather, as a motivating factor. The role of HR is to facilitate change and influence its direction, hence, attention should be paid to the linkages and interrelations among the three integration processes running in parallel, and their influence on each other. For instance, process redefinition in the category of systems integration, linked with international personnel transfer and reorganisation (personnel integration), will be influenced by legal constraints and the availability of expert talents in the market. This uncertainty is usually unforeseen before the integration process and, therefore, change management is both a challenge and a major part of HRIP tasks.

4.3 Evaluation (designed outcome and/or dysfunction)

An important part of managing a control system is the feedback loop, controlling the designed outcome (i.e. integrated HR systems, cost efficiency, successful transfer of knowledge, combined advantage for both companies, and effective control and feedback) and influencing the failures (high cost, ineffective systems, negative emotions, loss of key personnel, lack of resources, and prolonged integration).

All control functions are linked to cost, therefore, the method of control directly influences outcomes and costs. The tighter the control, the higher the likelihood of designed outcome; however, the related cost is high. A typical profit-oriented

organisation maintains a balance between functional behaviours and cost, however, maintaining control of other dysfunctional outcomes is challenging.

To achieve long-term success and ensure the continued development of the company, a few important HR management characteristics may be excluded, such as employee training, rewards, and compensation. The findings of this study have important implications for managers seeking to better manage post-M&A integration. Generally, in Chinese companies, less effort is made in training related to creativity, management skills, and culture. Moreover, mid- to long-term incentive plans are seen as weak areas for Chinese overseas human resource management. Findings from interviews and category coding show that the perceptions of critical events during integration among employees are primarily related to their emotional states. These events, even where they are challenging, do not entail negative outcomes. Conflict or difficulties due to changes caused by the acquisition should not be seen as challenges but as positive occurrences.

The challenges of integration are perceived as drivers of motivation and success. The high-performance orientation of a work team is the key driver of a successful integration outcome. Employees in the acquired company are more concerned with the opportunities for multi-cultural experiences. In particular, when action taken to solve the dilemma is justified, these employees' discourses feature a performance orientation (even if the integration is not ultimately ideal).

5. Discussion and conclusion

There has been a growing body of research on the variables and processes that affect the success of cross-border acquisitions. However, the critical success factors and the reasons why acquisitions integration often fail are inadequately understood [119]. According to Gunkel et al. [51], mechanisms involved during the PMI process are still unclear to scholars, and practitioners may prevent exploitation of the potential synergy that can arise from sharing or transferring resources and skills. Secondly, cross-cultural conflicts and differences between the two companies may cause problems such as stress and negative attitudes toward the acquiring company and its management, including high turnover of the acquired top executives [120].

This research responds to these calls by providing insights into the process of integrating operating synergies. It empirically investigated the human resource integration processes (HRIP) to understand the dynamics of the post-M&A phase in a cross-cultural context. The HRIP presented in this research provide a clear overview of the primary human resources that are relevant to the post-phase of a cross-border M&A. However, the interactions among the constituents of the system and the interaction between the system and its environment are complex. Thus, focusing on the critical success factors facilitating the integration of tasks and the dissemination of skills of the acquired firms, is important. This study's intent was to develop a better understanding of the parameters that make the post M&A HR integration process successful, in the context of cross-border acquisitions, thus contributing to a better understanding of the value-added creation process and synergy realisation in international M&As.

This study contributes to international management research and provides managerial implications regarding cross-border M&As in several ways. First, a framework for HRIP is proposed. This framework will assist both managers and policymakers to understand the integration approach dominantly used in Chinese cross-border M&As and benefit from the potential synergy in the wake of Chinese cross-border M&As [121].

The proposed framework (**Figure 2**) incorporates three theoretical perspectives, into an integrative model and addresses post-acquisition factors and issues. It is offered as a descriptive and analytical device rather than a prescriptive model, to highlight the management of the post-acquisition integration process illuminated in this study. Secondly, the framework presented can assist consultants and executives in conducting better assessments at all stages of the M&A, including screening, planning, and negotiation. Thus, it enhance the effectiveness of interventions carried out during a post-M&A HRIP. As such, this study emphasises the role of corporate HR integration analysis as an essential and influential milestone for the exploration of the international business environment [24]. Most importantly, an approach that centres on human resource integration could drive the development of organisational integration in a positive direction. Therefore, the framework proposed in this research has implications that extend beyond the limitations of the field of HR management.

5.1 Limitations and directions for future research

Perhaps the most straightforward implications are those derived from a logical interpretation of a researcher's findings. ([122], p. 257) This study develops insights into the HRIP in the post-M&A period of a Chinese-acquired Western company [123]. There are both theoretical and managerial implications to the finding.

The knowledge produced should not be taken to be general, but instead specific to two sets of societies in a certain context. This knowledge is local, in that, it may be true and useful for Chinese managers who seek to work in Western environments. It is difficult to evaluate the consequences that flow from the choice of the HRIP in the relatively short history of Chinese cross-border M&As [20], Company D was more willing to cooperate during the research process than the others and we took advantage of this by interviewing more candidates within the company compared with the other companie, it may created a bias to the findings and study. However, it is valuable to monitor the further developments of these M&As and measure organisational performance over time. 'I think our top management underestimated the challenge of HR integration and overestimated the value of human capital when the deal was made' (Participant 21). Hence, further studies on these companies in the course of time, will be beneficial.

The evidence collected in this research supports the conclusions of recent studies, which have shown that connecting the pre- and post-M&A stages may yield improved M&A performance in general [124]. These studies report that if both strategic fit (synergy potential) and organisational fit (cultural differences and the national culture of the acquiring company) factors are known, pre-mergers can be taken into account in the choice of the post-acquisition integration approach. M&A performance is superior in deals that did not take pre-acquisition factors into account in post-acquisition decisions.

This study identifies theoretical aspects that may provide direction for future research in the field of post-M&A integration:

- On the macro-level, from a strategic perspective, a focus on the interactions and interrelations between the steps during the human resource integration process (HRIP) could be fruitful.

- At the micro-level, the individual process that often are barriers to synergistic integration, has been overlooked, (e.g. management divisions) and is worth further study.

It should be noted that the conceptual framework was developed through qualitative research and would require further validation with quantitative research to test the theory on a broader scale. As more cases from other industries and countries become available, it suggests using quantitative methods to test the framework.

It is the hope that the theoretical integration and review in this paper can provide a clear organising framework for future work, and that the conceptual framework proposed in this research will benefit the creation of a future focus in this field.

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Chapter 9

Expatriate Satisfaction and Motivation in Multinational Corporations

Yanghua Zhou

Abstract

Employee satisfaction and motivation have an important influence on individual employees and the performance of companies. In international business and marketing, where expatriates play important roles, regional cultures and institutional factors impact their satisfaction and motivation. This chapter aims to find out what kind of regional cultures and institutions have an impact on employee satisfaction and motivation in multinational corporations (MNCs), using theoretical analysis and the results from around 100 Japanese expatriates' questionnaires. It was possible to find the satisfaction and motivation-related characteristics of expatriates in MNCs from the results of their interviews and the questionnaire survey, which indicated that Japanese expatriates working in the USA, Singapore, and Indonesia had a higher job satisfaction degree than those working in cultural regions, such as China, Taiwan, and Australia. Moreover, the results showed that compared with other industries, in the sales and marketing industry, the Japanese expatriates had the lowest satisfaction degree after repatriation, although their satisfaction degree was higher during expatriation and after a career change. The reasons relating to regional cultures and institutions, and some methods and human resource management practices in international marketing and trading that were analyzed are expected to raise expatriates' satisfaction and motivation.

Keywords: expatriate, satisfaction, motivation, culture, institution

1. Introduction

Globalization has created a lot of opportunities and challenges in the world economy, especially for trade and marketing enterprises, as well as employees. The performance of multinational corporations (MNCs) and trading industries are significantly impacted by culture, institutions, as well as economic and political factors. Further, as internal impact factors, employees' motivation and job satisfaction also have a crucial influence on the accomplishments of MNCs and the trading and marketing industry.

Expatriates play important roles in globalization and international marketing and trading. The term "expatriates" refers to home country nationals, who are assigned from headquarters to work in overseas subsidiaries for 3–5 years. After their expatriation assignment, they can repatriate to their headquarters, and utilize their experiences and knowledge from their overseas assignment [1].

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When they work overseas, they have to adapt to the local culture and institutional environment.

Expatriates are considered as special and important employees in MNCs. Japanese MNCs mainly promote localization in Europe and America. However, in overseas subsidiaries of Japanese MNCs in Asian countries, Japanese expatriates from headquarters still play important roles, instead of local employees, even though localization is also conducted gradually in these subsidiaries. However, the job satisfaction and motivation of these Japanese expatriates needs to be raised, given that, some of them quit during the expatriation period without repatriating to headquarters, as scheduled. This brings significant damage to both the overseas subsidiaries and headquarters of the Japanese MNCs.

Employee satisfaction and motivation have an important influence on individual employees and the performance of companies. In the international marketing and trading business, expatriates play important roles. Previous literature indicates that expatriates' satisfaction and motivation will be impacted by regional cultures and institutional factors. This chapter addresses the research gaps relating to the kinds of regional cultures and institutions that have an impact on expatriates' satisfaction and motivation in MNCs. The results obtained from the interviews and questionnaire survey, were able to reveal the characteristics related to satisfaction and motivation of Japanese expatriates in MNCs. Furthermore, reasons related to regional culture and institutional issues, and some methods and human resource management practices in international business that were analyzed, are expected to raise employee satisfaction and motivation. Some topics for future research are also discussed in the final part of this chapter.

2. Previous literature

2.1 Culture

Culture is considered a central concept in anthropology, encompassing the range of phenomena that are transmitted through social learning in human societies, as stated in Wikipedia [2].

Moreover, culture is an umbrella term which encompasses the social behavior and norms found in human societies, as well as the knowledge, beliefs, arts, laws, customs, capabilities, and habits of the individuals in these groups [3].

Japan is a country with a long history and a unique culture. When Japanese expatriates work overseas, culture and the institutional environment are very important for them. Japan's traditional employment style is career employment, with a relational psychological contract between the employees and employers being common, along with collectivism in their high context society [4]. However, in recent years, performance-based pay system has been introduced in Japan. Meanwhile, in some cases, the psychological contract is also changing from relational to transactional.

It has been stated [5] that context refers to the environment, in which people carried out their communications, considering society, psychology, timing, etc. According to Ferraro [6], high to low context levels exist in Japan, China, Arabia, Greece, Spain, Italy, English, France, America, and Germany. Hence, people in various cultures and context environments carry out communications in different ways. Especially in advanced countries and emerging economies, management approaches and lifestyles differ greatly. In high context culture environments, people share detailed information with group members more frequently and implicitly. On the contrary, in low context cultural countries or regions, people talk more frankly with each other.

Other scholars have pointed out that leadership could not transcend cultures. Leadership styles in the USA and Middle East are significantly different. Managers in the United Arab Emirates are found to be less transformational and more passive than managers in the USA and Europe [7]. Differences in leadership styles in various cultural organizations cause frustration and conflict among managers [8].

Organizations also have their own company cultures. A strong company culture helps to reduce management and monitoring costs, and also serves as a good reference of a behavior model. It facilitates information transference and raises a company's work efficiency. It even has an influence on organization transformation. However, a company's culture will be influenced by the culture of the country in which it is located, and its leadership style. Therefore, cultures in companies or countries have significant impact on the performance of both employees and organizations.

2.2 Institutions

Institutions have been described as "integrated systems of rules that structure social interactions" [9].

Moreover, institutions can refer to mechanisms which govern the behavior of a set of individuals within a given community, and are also identified with a social purpose, transcending individuals and intentions, by mediating the rules that govern living behavior [10].

2.3 Institutions and governance/management

From the perspective of new institutional economics, it has been stated [11] that institutions would change, along with the economy and environment. In different regions, there are various institutions and cultures. These theories are implemented in business strategy, corporate governance, and property. Governance has been divided into two kinds: relational and hierarchical governance [12]. In developing countries or regions, where institutions or laws are not that advanced, it is easier to control people's behaviors through personal relationship networks, the culture of a company or country, or societal ethics, which is called relational governance. On the contrary, in advanced countries or regions, where institutions and managements are developed to a relatively high extent, people can be controlled by rules, manuals, or institutions at a high level, which is called hierarchical governance.

Hence, in this globalized world, businesses freely advance into many countries and regions across the world. However, we cannot ignore the cultural and institutional characteristics of every country or region since invisible culture walls exist between different countries. Hence, the important concept of "semi-globalization" exists [13]. When actively promoting a trading or marketing business in foreign countries, it is also necessary to respect the differences in culture and institutional environments between host countries and the headquarter country.

2.4 Motivation

In 1970, Maslow [14] proposed the 5 levels of hierarchy of needs theory. These basic needs of human beings have a significant relationship with employees' motivation.

Motivation—derived from the word "motive" or a need that requires satisfaction—is a reason for actions, willingness, and goals. These needs, wants or desires may be acquired through the influence of culture, society, lifestyle, or may be generally innate, as has been stated in Wikipedia [15]. Individuals' motivation could

be inspired by outside forces (extrinsic motivation) [16], or those within individuals because it is naturally satisfying to them (intrinsic motivation) [17].

In a company, there are many kinds of extrinsic motivation, such as compensation, bonus, promotions, expanded responsibility, awards, opportunity of on-job or off job training, travelling, stock options, and related qualifications. Additionally, emotions have an influence on motivation, and positive emotions can also raise one's motivation [18]. Hence, favorable personal relationship networks and workplace environments are also important for employees' motivation and job satisfaction. Such extrinsic motivators can also be called incentives to some extent. The importance of intrinsic and extrinsic motivation in business has been emphasized [19].

2.5 Incentives

An incentive is something that motivates or drives one to do something or behave in a certain way [20]. There are two type of incentives—intrinsic and extrinsic—that affect human decision making, as stated in Wikipedia [21]. Intrinsic incentives motivate persons to do something out of their own self-interest or desires, without any outside pressures or promised rewards [22], whereas extrinsic incentives are motivated by rewards, such as an increase in pay for achieving a certain result; or avoiding punishments such as disciplinary action, or criticism as a result of not doing something [20, 22].

The expectancy theory [23] posits that an individual's motivation is a function of two factors: (i) expectancy about the relationship between the effort and a particular outcome and (ii) the valence of that outcome. Monetary incentives like compensation have valence for a variety of reasons. Therefore, employees' motivation and subsequent efforts are significantly high if compensation is based on performance.

It has been stated that items that motivate and incentivize expatriates, include providing effective programs before or during expatriation, reasonable selection and promotions, fare performance evaluations, attractive compensation during expatriation, full consideration or correspondence for their families, career up or career design considerations, etc. [24]. This is because these items comprise important contents of psychological contracts between expatriates and their headquarters, which expatriates expect their headquarters to conscientiously fulfill.

3. Research methods

To find the difference in expatriates' satisfaction degree between various industries (sales and marketing, manufacturing, service, etc.), a questionnaire survey was conducted in 2015, which revealed distinct characteristics of various regions or countries such as USA, Singapore, Indonesia, China, Australia, etc. The questionnaires were distributed to around 100 Japanese expatriates, who were required to answer satisfaction and motivation-related questions pertaining to their last expatriation of more than a year's duration. The expatriates were older than 25 years, their job types included civil servants, company employees, freelancers, etc., and their education qualifications ranged from high school graduates to doctorates (see **Tables 1–3**).

4. Results of the questionnaire survey

Based on the aforementioned questionnaire survey, this section summarizes its results based on categories, such as industries, job types, and regions.

		Q12 Comment on your job satisfaction during the expatriation						
		All	**Very satisfied**	**A little satisfied**	**I can't say**	**Not very satisfied**	**Not satisfied**	**Average**
All		103	17.5	55.3	16.5	6.8	3.9	
Age	25 ~ 29	13	15.4	76.9	7.7	0.0	0.0	
	30 ~ 34	12	0.0	50.0	41.7	8.3	0.0	
	35 ~ 39	14	14.3	50.0	21.4	7.1	7.1	
	40 ~ 44	16	25.0	37.5	12.5	18.8	6.3	
	45 ~ 49	19	26.3	57.9	5.3	10.5	0.0	
	50 ~ 54	14	28.6	42.9	21.4	0.0	7.1	
	55 ~ 59	11	0.0	81.8	9.1	0.0	9.1	
	60 and over	4	25.0	50.0	25.0	0.0	0.0	
All		103	17.5	55.3	16.5	6.8	3.9	
Job	Civil servant	3	33.3	66.7	0.0	0.0	0.0	
	Company employee (administrative)	33	15.2	63.6	12.1	9.1	0.0	
	Company employee (technical)	48	22.9	43.8	27.1	4.2	2.1	
	Company employee (other)	19	5.3	68.4	0.0	10.5	15.8	
All		103	17.5	55.3	16.5	6.8	3.9	
Q1 Diploma	High school graduate	19	21.1	42.1	26.3	10.5	0.0	
	Junior college graduate	2	0.0	100.0	0.0	0.0	0.0	
	Bachelor	66	16.7	59.1	10.6	7.6	6.1	
	Master's	11	9.1	45.5	45.5	0.0	0.0	
	Doctorate	4	25.0	75.0	0.0	0.0	0.0	
	Other	1	100.0	0.0	0.0	0.0	0.0	

		Q12 Comment on your job satisfaction during the expatriation						
		All	**Very satisfied**	**A little satisfied**	**I can't say**	**Not very satisfied**	**Not satisfied**	**Average**
All		103	17.5	55.3	16.5	6.8	3.9	
Q3 Your rank in the latest expatriation longer than 1 year	Ordinary Staff	27	11.1	51.9	29.6	7.4	0.0	
	Team leader	27	18.5	59.3	14.8	3.7	3.7	
	Section manager	19	26.3	47.4	10.5	0.0	15.8	
	Department manager	27	18.5	59.3	7.4	14.8	0.0	
	Director level	3	0.0	66.7	33.3	0.0	0.0	
	Other	0	0.0	0.0	0.0	0.0	0.0	
All		103	17.5	55.3	16.5	6.8	3.9	
Q5 Your work in the latest expatriation longer than 1 year	Technology	36	16.7	55.6	19.4	5.6	2.8	3.78
	Management	37	13.5	59.5	18.9	5.4	2.7	3.76
	Sales & Marketing	13	30.8	46.2	0.0	15.4	7.7	3.77
	Planning	14	21.4	50.0	14.3	7.1	7.1	3.71
	Other	3	0.0	66.7	33.3	0.0	0.0	3.67
All		103	17.5	55.3	16.5	6.8	3.9	
Q2 Your current rank	Ordinary Staff	25	12.0	48.0	32.0	8.0	0.0	
	Team leader	26	15.4	69.2	7.7	3.8	3.8	
	Section manager	29	24.1	41.4	20.7	3.4	10.3	
	Department manager	19	21.1	57.9	5.3	15.8	0.0	
	Director level	4	0.0	100.0	0.0	0.0	0.0	

		Q12 Comment on your job satisfaction during the expatriation						
		All	**Very satisfied**	**A little satisfied**	**I can't say**	**Not very satisfied**	**Not satisfied**	**Average**
All		103	17.5	55.3	16.5	6.8	3.9	
Q4 Your current job type	Technology	41	17.1	56.1	17.1	7.3	2.4	
	Management	33	15.2	54.5	18.2	9.1	3.0	
	Sales & Marketing	15	26.7	60.0	0.0	6.7	6.7	
	Planning	10	20.0	50.0	20.0	0.0	10.0	
	Other	4	0.0	50.0	50.0	0.0	0.0	
All		103	17.5	55.3	16.5	6.8	3.9	
Q7 The industry type of the latest expatriation longer than 1 year	Manufacturing	54	20.4	48.1	22.2	7.4	1.9	3.78
	Sales & Marketing	13	30.8	53.8	0.0	7.7	7.7	3.92
	Service	27	3.7	63.0	18.5	7.4	7.4	3.48
	Government	6	33.3	66.7	0.0	0.0	0.0	4.30
	Other	3	0.0	100.0	0.0	0.0	0.0	

Table 1.
Job satisfaction during expatriation.

		Q22 Comment on your job satisfaction after you repatriated						
		All	**Very satisfied**	**A little satisfied**	**I can't say**	**Not very satisfied**	**Not satisfied**	**Average**
All		91	8.8	48.4	25.3	8.8	8.8	
Age	25 ~ 29	7	0.0	85.7	0.0	0.0	14.3	
	30 ~ 34	10	0.0	30.0	50.0	10.0	10.0	
	35 ~ 39	13	7.7	46.2	15.4	0.0	30.8	
	40 ~ 44	15	13.3	46.7	20.0	20.0	0.0	
	45 ~ 49	18	5.6	38.9	33.3	11.1	11.1	
	50 ~ 54	14	21.4	42.9	21.4	14.3	0.0	
	55 ~ 59	10	0.0	80.0	20.0	0.0	0.0	
	60 and over	4	25.0	25.0	50.0	0.0	0.0	
All		91	8.8	48.4	25.3	8.8	8.8	
Q1 Diploma	High school graduate	17	5.9	52.9	35.3	5.9	0.0	
	Junior college graduate	1	100.0	0.0	0.0	0.0	0.0	
	Bachelor	59	8.5	49.2	23.7	6.8	11.9	
	Master's	9	0.0	33.3	22.2	33.3	11.1	
	Doctorate	4	0.0	75.0	25.0	0.0	0.0	
	Other	1	100.0	0.0	0.0	0.0	0.0	
All		91	8.8	48.4	25.3	8.8	8.8	
Q3 Your rank in the latest expatriation longer than 1 year	Ordinary Staff	21	0.0	57.1	28.6	4.8	9.5	
	Team leader	24	16.7	45.8	29.2	4.2	4.2	
	Section manager	17	11.8	35.3	23.5	11.8	17.6	
	Department manager	26	3.8	57.7	15.4	15.4	7.7	
	Director level	3	33.3	0.0	66.7	0.0	0.0	
	Other	0	0.0	0.0	0.0	0.0	0.0	

		Q22 Comment on your job satisfaction after you repatriated						
		All	**Very satisfied**	**A little satisfied**	**I can't say**	**Not very satisfied**	**Not satisfied**	**Average**
All		91	8.8	48.4	25.3	8.8	8.8	
Q5 Your work in the latest expatriation longer than 1 year	Technology	31	9.7	54.8	25.8	0.0	9.7	3.55
	Management	32	6.3	56.3	21.9	9.4	6.3	3.47
	Sales & Marketing	12	8.3	33.3	33.3	8.3	16.7	3.08
	Planning	13	15.4	23.1	23.1	30.8	7.7	3.08
	Other	3	0.0	66.7	33.3	0.0	0.0	3.67
All		91	8.8	48.4	25.3	8.8	8.8	
Q2 Your current rank	Ordinary Staff	18	0.0	50.0	33.3	5.6	11.1	
	Team leader	23	17.4	43.5	21.7	8.7	8.7	
	Section manager	27	7.4	37.0	29.6	11.1	14.8	
	Department manager	19	5.3	68.4	15.8	10.5	0.0	
	Director level	4	25.0	50.0	25.0	0.0	0.0	
	Other	0	0.0	0.0	0.0	0.0	0.0	
All		91	8.8	48.4	25.3	8.8	8.8	
Q4 Your current job type	Technology	34	8.8	55.9	23.5	2.9	8.8	
	Management	30	10.0	50.0	26.7	6.7	6.7	
	Sales & Marketing	14	7.1	42.9	28.6	7.1	14.3	
	Planning	9	11.1	22.2	22.2	33.3	11.1	
	Other	4	0.0	50.0	25.0	25.0	0.0	

		Q22 Comment on your job satisfaction after you repatriated						
		All	**Very satisfied**	**A little satisfied**	**I can't say**	**Not very satisfied**	**Not satisfied**	**Average**
All		91	8.8	48.4	25.3	8.8	8.8	
Q7 The industry type of the latest expatriation longer than 1 year	Manufacturing	46	10.9	47.8	23.9	8.7	8.7	3.43
	Sales & Marketing	12	8.3	50.0	16.7	8.3	16.7	3.25
	Service	24	4.2	50.0	25.0	12.5	8.3	3.29
	Government	6	16.7	50.0	33.3	0.0	0.0	3.83
	Other	3	0.0	33.3	66.7	0.0	0.0	3.33

Table 2.
Job satisfaction after repatriation.

		Q30 Comment on your job satisfaction after your career change						
		All	**Very satisfied**	**A little satisfied**	**I can't say**	**Not very satisfied**	**Not satisfied**	**Average**
All		10	10.0	70.0	10.0	10.0	0.0	
Age	25 ~ 29	6	16.7	66.7	16.7	0.0	0.0	
	30 ~ 34	1	0.0	100.0	0.0	0.0	0.0	
	35 ~ 39	1	0.0	100.0	0.0	0.0	0.0	
	40 ~ 44	1	0.0	0.0	0.0	100.0	0.0	
	45 ~ 49	1	0.0	100.0	0.0	0.0	0.0	
All		10	10.0	70.0	10.0	10.0	0.0	
Job	Company employee (administrative)	4	0.0	50.0	25.0	25.0	0.0	
	Company employee (technical)	3	0.0	100.0	0.0	0.0	0.0	
	Company employee (other)	3	33.3	66.7	0.0	0.0	0.0	
All		10	10.0	70.0	10.0	10.0	0.0	
Q1 Diploma	High school graduate	2	0.0	100.0	0.0	0.0	0.0	
	Junior college graduate	1	0.0	100.0	0.0	0.0	0.0	
	Bachelor	6	16.7	66.7	0.0	16.7	0.0	
	Master's	1	0.0	0.0	100.0	0.0	0.0	
All		10	10.0	70.0	10.0	10.0	0.0	
Q3 Your rank in the latest expatriation longer than 1 year	Ordinary Staff	6	16.7	50.0	16.7	16.7	0.0	
	Team leader	3	0.0	100.0	0.0	0.0	0.0	
	Section manager	1	0.0	100.0	0.0	0.0	0.0	
All		10	10.0	70.0	10.0	10.0	0.0	

		Q30 Comment on your job satisfaction after your career change						
		All	**Very satisfied**	**A little satisfied**	**I can't say**	**Not very satisfied**	**Not satisfied**	**Average**
Q5 Your work in the latest expatriation longer than 1 year	Technology	3	0.0	100.0	0.0	0.0	0.0	4.00
	Management	5	20.0	80.0	0.0	0.0	0.0	4.20
	Sales & Marketing	1	0.0	0.0	0.0	100.0	0.0	2.00
	Planning	1	0.0	0.0	100.0	0.0	0.0	3.00
	Other	0	0.0	0.0	0.0	0.0	0.0	
All		10	10.0	70.0	10.0	10.0	0.0	
Q2 Your current rank	Ordinary Staff	6	16.7	50.0	16.7	16.7	0.0	
	Team leader	3	0.0	100.0	0.0	0.0	0.0	
	Section manager	1	0.0	100.0	0.0	0.0	0.0	
All		10	10.0	70.0	10.0	10.0	0.0	
Q4 Your current job type	Technology	5	20.0	60.0	0.0	20.0	0.0	
	Management	3	0.0	100.0	0.0	0.0	0.0	
	Sales & Marketing	1	0.0	100.0	0.0	0.0	0.0	
	Planning	1	0.0	0.0	100.0	0.0	0.0	
	Other	0	0.0	0.0	0.0	0.0	0.0	
All		10	10.0	70.0	10.0	10.0	0.0	
Q7 The industry type of the latest expatriation longer than 1 year	Manufacturing	6	16.7	66.7	0.0	16.7	0.0	3.83
	Sales & Marketing	1	0.0	100.0	0.0	0.0	0.0	4.00
	Service	3	0.0	66.7	33.3	0.0	0.0	3.67
	Other	0	0.0	0.0	0.0	0.0	0.0	

Table 3.
Job satisfaction after a career change.

4.1 Results category by industry and the sales & marketing job type

The average value of expatriates' satisfaction degree in the sales and marketing industry were 3.92 (during expatriation), 3.25 (after repatriation), and 4 (after a career change) (see **Tables 1–3**). As compared with other industries, for sales and marketing, the satisfaction degree after repatriation was the lowest at 3.25, but during expatriation and after a career change it was higher than that of other industries.

Conversely, when expatriates had worked for the government, their satisfaction degree was the highest after repatriation as well as during expatriation. However, their satisfaction degree during expatriation and after a career change were the lowest when they had worked in service industries. Similarly, the satisfaction degree after repatriation was also at a low level, compared with other industries.

These results show that expatriates in sales and marketing, as well as service industries experience more difficulties during expatriation. Thus, they need more incentives to raise and keep their work motivation at a relatively high level. The values in various regions are shown in **Table 4**.

A comparison of sales and marketing with other job types indicate that while the satisfaction degree during expatriation was relatively high (higher than average), it was the lowest after repatriation or a career change. The reason for this result is also worthy of discussion.

4.2 Results category by region and country

From the perspective of expatriates working overseas in various regions and countries, as shown in **Table 4**, their working places in this survey mainly included USA, China, Taiwan, Thai, Indonesia, Singapore, Australia, etc. Their average satisfaction degree values were 2.24, 2.6, and 2.2 during expatriation, after repatriation, and after a career change, respectively.

The satisfaction degree was higher than the average levels in the following cases: during expatriation of those in USA, Singapore, and Indonesia; after repatriation of those in USA, Thai, Singapore, and Indonesia; and after a career change of expatriates working in the USA and China during expatriation. Thus, it seems that working

Assigned country or region	Number of expatriates	Number of expatriates who turned to another company after expatriation	Satisfaction degree values[a] during expatriation	Satisfaction degree values[a] after repatriation	Satisfaction degree values[a] after a career change
USA	21	3	2.38	2.89	2.33
China	21	2	2.14	2.32	2
Taiwan	9	0	1.67	2.22	
Thai	8	0	2.13	2.88	
Singapore	6	0	2.5	3.17	
Indonesia	7	0	2.86	2.83	
Australia	4	2	2	2.5	1.5
Total	103	10	2.24	2.6	2.2

[a]*Values ranged from 1 to 5 in the questionnaire's options.*

Table 4.
The satisfaction degree in different countries.

in USA, Singapore, and Indonesia creates a higher job satisfaction degree than working in other places.

4.3 Reasons based on industry and the sales and marketing job type

It is necessary to analyze the reason why the satisfaction degree relating to the sales and marketing industry is high during expatriation, while it is the lowest after repatriation. As this industry's mission is to explore foreign markets, it is easier for it to adapt to overseas environments and new cultures, compared with other industries. Due to its characteristic of being open minded, its satisfaction degree during expatriation is high. Since after repatriation, the objective that needs to be explored changes, expatriates have to adjust the direction of their work, try to acquire knowledge of new products and related fields, and build relationships with new domestic clients. Because of resource peculiarity and culture distance between the host country and parent country, the knowledge, experience, and even local personnel relationship they acquired or built in foreign subsidiary in the host country are not able to be utilized fully any more in the headquarter in parent country sometimes after repatriation. In some cases after repatriation, Japanese expatriates are assigned to positions where work contents are very different with before, which has negative impact on job satisfaction degree and some expatriates quit after repatriation. This can also be considered as a part of the reasons why the satisfaction degree is not low after career change. Usually, people turn to work in companies where their experiences and knowledge can be taken full advantage. If their knowledge and experiences can be used to a relatively high extent, this has positive influence on their job satisfaction degree. Furthermore, they have to once again cope with the culture shock.

In government industries, the work stress is not as heavy as in the sales and marketing or service industries. Their main work is to build relationships with local governments and big companies. Since government expatriates also conduct some surveys in terms of foreign markets and society-related issues, their satisfaction degree is high.

Contrarily, expatriates in the service industry have higher work stress because they have to carefully understand the local culture and customs, and use them correctly and flexibly, so that they are able to explore and retain enough foreign new clients. Their communication and interaction with local clients have a significant influence on their company's performance.

4.4 Reasons based on regions and countries

This section analyzes the reasons in terms of the characteristics of culture and institutions in different regions and countries. The reasons partly lie in the characteristics—economy, culture, institutions, and history—of these 3 countries: USA, Singapore, and Indonesia, in which, the satisfaction degree of Japanese expatriates is higher.

USA has a long-term trading partnership with Japan—one of its biggest trading partners. It also respects culture building itself and promotes cultural communications with other countries. In past decades, it promoted a lot of cultural products to countries all over the world. Being an immigrant country, its cultural characteristics comprise diversity and openness in populations and regions. Its annual GDP exceeds 60000 dollars per year and it has a good economic environment. In USA, people use data and manuals to manage employees, rather than relationships or personal networks. Thus, it is easy for employees who work hard since they will not have the difficult task of trying to develop skills to build good relationships with supervisors. Hence, Japanese expatriates find it a good place to live and work.

Singapore too, has an open cultural environment, and Japan is one of its biggest trading partners. It is located in Asia and more than 70% of its population are Chinese. It embraces several religions, and with England's long and important influence on its history, it follows English traditions that contribute to its stable circumstances. It is famous for its cleanliness because of its comfortable weather. Singapore is also a developed country and among the best international financial centers in the world, along with New York, London, and Hongkong. Since its finance and other related rules and institutions are very well organized, it is easy for Japanese expatriates to adapt to its institutional environment.

Indonesia has many nations and is a multicultural country. It has many religions and beautiful places, such as the Bali island, a world-famous place. It also has many kinds of delicious food, which attract many travelers every year. Hence, it is easy for foreigners to live and work in Indonesia, although it is not an advanced country and its weather is a little hot in summer.

In contrast, the satisfaction degree is lower than average in China, Taiwan, and Australia.

China is a multicultural country with a very long history. Its open culture environment and delicious food welcomes foreign investments, companies to establish subsidiaries, and foreigners to work in China. Both the Chinese and Japanese use Chinese characters in their language, which is a commonality between China and Japan. Hence, it is convenient for Japanese expatriates to learn Chinese, adapt to the Chinese lifestyle, and work there. However, it is not an advanced country and its institution and policies for business management as well as other fields still need improvements and innovation. Taiwan is similar to China to some extent in terms of culture. Moreover, Japan is a country with a high context communication environment, where people express their opinions more implicitly. This kind of communication style of Japanese expatriates needs better understanding and cooperation of local Chinese employees.

In China, economic reforms and opening-up that have been prevalent for more than 40 years, have brought about a lot of wonderful changes to many facets of China. However, its management style and communication-related issues have existed during the whole developing process. In China, relational governance is still the main style. Contrarily, Japan is an advanced and developed country, where hierarchical governance is implemented to a large extent. Rules and law are set in detail in terms of a lot of facets of society and business. This is another big difference between Japan and China.

Australia is at a high World Happiness Index ranking. It also has several religions and a multicultural environment, along with beautiful mountains and rivers for people to enjoy. Its economic situation is also stable. Therefore, it is a comfortable place, where foreigners find it easy to work. Yet, expatriates have a lower than average satisfaction degree. The reason is worthy of discussion. It has been stated that the methods of performance appraisal of Australian expatriates in Singapore and Singaporean expatriates in Australia are greatly different in terms of performance against set indicators, rating of specific competencies, set and evaluate personal goals, management by objectives, informal discussion with superior, et. [25]. Previous literature also indicates that Japanese expatriate managers rely on cultural mediators more [26]. The themes of cultural mediators' features refer to reliance on a third party individual, role of "go-betweens", and bicultural characteristics. Other scholars state that becoming mutual sunao (accepting) is crucial in trust and intercultural communication based on research on Japanese expatriate managers and Australian supervisors [27]. These conclusions provide hint to consider the reason from intercultural communication and performance evaluation system of local subsidiaries.

5. Implications and discussion

To raise the satisfaction degree of the service industry as well as the sales and marketing industry, it is better for the headquarters to undertake adequate foreign culture training and marketing surveys prior to assigning expatriates to work overseas since it helps them to adapt to the local work environment faster and also raises their work performance. Additionally, it is useful for reducing their work stress during expatriation, and facilitates the building of smooth personal relationship networks, all of which, contribute to enhancing expatriates' skills and task achievements, which lead to higher job satisfaction. Another approach to raise the satisfaction degree after repatriation is to prepare fitful positions for expatriates and create better opportunity to utilize their experience, knowledge, and network with local government or employees. This has positive effect on their retention rate and prevent them from turning over after repatriation.

To raise the levels of motivation and satisfaction in China and Taiwan, helpful measures could be higher compensation, better work conditions, welfare, consideration for families, language support during expatriation, promotion or expanded responsibility after repatriation, etc. In parallel, China's vast external environment—companies, institutions, business customs, commercial practices, and management systems—are in dire need of urgent innovation. While the Chinese MNCs have been progressively increasing in recent years, their management and business styles still need to be internationalized. If their management styles could be changed from relational governance to hierarchic governance, it would be easier for Japanese expatriates to adapt to their work and life in Chinese subsidiaries, which would help in increasing their motivation and job satisfaction.

To raise the satisfaction degree in Australia, several measures can be considered. Better trust relationship and intercultural communication environment will contribute to work performance and satisfaction degree. Mutual acceptingness plays important role in building this work place environment. Effective evaluation system is also important for expatriates in Australia. Hence, human resource managers could pay more attention and offer more effort on this facet. As one of the reasons that causes the low satisfaction degree during expatriation is the long distance between Japan and Australia, the headquarters could provide more free flights for expatriates to travel between these two countries for private purposes.

Additionally, not only is there a need to respect the cultures of these countries or regions, but it is also necessary to pay heed to their corporate cultures. Countries' cultures have an impact on their corporate cultures. However, every company has its own unique history, development path, leaders, and leadership styles which comprise their company's corporate culture. Thus, foreign expatriates also need to understand corporate cultures, especially in emerging countries, and adapt to them. Some other factors regarding society, politics, and international relationship are also needed to be considered.

6. Conclusions

This chapter reviews the theories on institutions, cultures, motivation, and incentives. Based on a combination of a comparative analysis of these theories and the questionnaire survey's results, the reasons were established for different characteristics in various cultures, countries, and industries, including sales and marketing, manufacturing, and service, etc. Additionally, to raise the satisfaction and motivation levels of expatriates in Japanese MNCs, institutional improvements

need to be implemented more thoroughly in local governments, along with respecting and understanding diverse cultures.

If we have more equally distributed samples, a valuable issue that needs to be further discussed is cross tabulation to check the relationship between job types and regions. For this, future research could collect additional and better data so that the reasons and impact factors for satisfaction degree can be analyzed more thoroughly.

This research is mainly based on data from expatriates in Japanese MNCs. Hence, how to apply the related conclusions to other cultural environments and industries is still an important issue. To confirm this conclusion or expand the direction of this research, future research could also obtain data from other countries. Interviews with expatriates and local employees is also a helpful approach as a case study to confirm the proposals and analyze the reasons in this chapter.

Conflict of interest

The author declares no conflict of interest.

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Chapter 10

The Impact of Quality Standards on the Business Performance of Small, Medium and Micro-Sized Enterprises in Kwazulu-Natal: Selected Cases in the Durban Metropolitan Area

Phindile B. Chili and Noluthando S. Matsiliza

Abstract

In the last decade, scholars showed an interest in alluding to compliance as a necessity to support small business performance in the last decades. Over the years, organisations have been frequently criticised for failing to comply with the quality standards such as the South African National Standards (SANS) 9001/ISO 9001 require effective implementation of Quality Management Systems and SANS 342, which provides specifications for diesel fuel products. Quality standards matrix adopted by the South African Bureau of Standards (SABS) is frequently used as a set of detailed specifications, requirements, various guidelines and characteristics to assure that the product, service or process is fit for purpose. Even though public and semi-autonomous institutions understand the value of subscribing and complying with quality standards, there is still a gap in the literature regarding the enforcement and compliance of quality standards in small business practices. There is a relationship between the adoption of quality standards and business excellence. Government can tap on the competitiveness of small, medium and micro-sized enterprises (SMMEs) and address their challenges and barriers that limit SMMEs to acquisition and compliance of statutory quality management systems.

Keywords: business excellence, customer satisfaction, quality management systems (QMSs), quality standards, small, micro and medium-sized enterprises, total quality management (TQM)

1. Introduction

A quality management system (QMS) involves a collection of business processes that consistently meet customer requirements and enhance customer satisfaction. It is aligned with an organisation's purpose and strategic direction [1]. Other commonly used quality standards such as ISO 9001/South African National Standards (SANS) 9001 provide requirements to be complied with to effectively implement a quality management system (QMS). In order to contextualise the relevance of the

three mainly used concepts and their interrelation to the study, they were defined as follows: firstly, the QMS, which has been defined above. Secondly, total quality management (TQM) is defined as 'an integrative firm widespread management philosophy aimed at continuously improving the quality of the processes, products and services by focusing on meeting or exceeding customer expectation to enhance customer satisfaction and organisational performance' [2].

Scholars in management studies alluded to quality standards as documents that provide requirements, specifications, guidelines or characteristics that can be used consistently to ensure that materials, products, processes and services fit their purpose [3].

Products that do not meet relevant quality standards are less marketable because of their inability to compete globally, thus impacting negatively business growth and expansion. The development programmes spearheaded by the government to ensure products and services are more competitive are not continuously monitored effectively to achieve the intended objectives. This challenge usually 'results in the duplication of efforts and hampers the development of the monitoring and evaluation framework for assessing the success of SMME programs' ([4], p. 9). The food industry is highly regulated. Therefore specific minimum hygienic and safety requirements are enforced. Nonadherence leads to severe repercussions. In the article, Top Performing Companies and Public Sector ([5], para.9 Line 4), the 2015 survey findings on the challenges faced by small, medium and micro-sized enterprises (SMMEs) are listed, of which 40% of them were due to burdensome regulations.

Neyestani [6] notes continuous improvement of the business quality performance based on establishing a proper system for leading the whole organisation effectively to meet customer requirements. Other research findings state that TQM results in an increasingly competitive advantage for firms. Thus, 'TQM is considered a cause of competitive advantage because it lets firms operate at a more competitive level and fulfil the needs of its consumers while minimising production costs and wastes, hence increasing the quality of the end product' ([7], p. 54). Similarly, Đorđević *et al*. ([8], p. 22) asserted that business excellence is possible to realise in two ways: by applying the concept of TQM. In concurrence with the assertions made by the different scholars mentioned above, it can be concluded that the hypothesis that correlates a positive relationship between the application of quality standards and business excellence is true. This chapter is based on the study conducted to assess the impact of quality standards in any business, whether in the manufacturing or service rendering sector and regardless of the size and complexity of the organisation. The following section will discuss the problem statement, review literature, expand on the research methodology and procedures, analyse data and elaborate on policy implications and conclusions and recommendations.

2. Problem statement

While the informal economy within the eThekwini Metropolitan area contributes to the city's development and social life, the SMMEs face diverse challenges that impact their growth and sustainability ([9], p. 1). According to Durban's Informal Economic Policy [10], 'both formal and informal economies make up the city's economy; however, SMMEs face impediments that emanate from the socio-economic and structural factors, which compel them to be exposed red tapes, noncompliance to regulations'. The author works very close with SMMEs as, based on the observations, it has been noted that most are faced with a cumbersome and expensive process of essential trading permits and licences acquisition. The article,

Top Performing Companies and Public Sector ([5], para.9 Line 6), notes that top-performing companies that amount to a total of 40% are challenged by the burdensome regulations that remain the impediments that are mostly facing SMMEs that end up stagnating their businesses.

The Small Enterprise Development Agency (SEDA) Report ([11], 18:28) also notes the challenges of noncompliance by South African SMMEs, and they continue to impact their business's success negatively. 'The heightened rate of informal business in the SMME sector due to higher unemployment needs to be addressed through focusing on reducing barriers to market entry, the regulatory burdens, easing labour relations and stepping up labour skills initiatives' ([11], 18:28). According to research findings by Van Scheers [12], among other challenges faced by SMMEs that are market-related include trading of products and services that do not meet some quality standards and regulatory and statutory requirements to put them at a better competitive advantage. This study intends to respond to the aim and the following primary question.

3. Conceptualising quality management system (QMS)

This study conceptualises the QMS to understand the objectives that organisations must follow. These objectives serve as outputs of an effective QMS in an organisation. They result from inputs and enablers, which include the application of quality standards, adoption of Total Quality Management (TQM) ideals and practices. These inputs may be translated into quality cultured organisations, improved quality products, processes and services. The below diagram profiles the enrichment of quality standards in an organisation.

Figure 1 below depicts the entrenchment of quality standards enabling the quality principles to be translated through a process into an effective QMS. These quality

Figure 1.
Entrenchment of quality standards. Source: American Society for Quality [3].

principles are adopted from ISO 9000:2015 standard by organisations who strive for continual improvement. Proponents claim that the entrenchment of quality standards such as ISO 9001 promotes best practices and, ultimately, an effective QMS. However, organisations need to be prepared to change their culture and how they have been doing business. This change should adopt quality principles such as the following:

- **Customer focus**: Every employee within the organisation's value chain should be customer-orientated, thereby committing to meeting and exceeding the current and future requirements. Customer-orientated organisations consistently improve customer retention and satisfaction [13]. 'Every organisation wants to aim for the best, and a good company focuses on customer satisfaction because they are the main output' ([7], p. 31). When a customer is retained and satisfied, this then leads to improved financial and business sustainability.

- **Leadership**: Top management should demonstrate exemplary leadership and commitment in setting goals and strategic positions in an organisation and ascertain their realisation. These objectives may include improved financial and business sustainability, efficient and effective operations, compliance to relevant regulations and statutory requirements, products and services that are fit for use and safe products security against climatic or other hostile circumstances. Saiti [14] believes that leadership selection criteria are essential in improving quality management in an organisation.

- **Engagement of people**: Organisations require the inputs of every employee to take the objectives in the right direction [15]. When top management engages employees by addressing their opportunities, threats, strengths and weaknesses, this exercise encompasses enterprise risk management, and such engagements may bring about positive outcomes. Organisations must recognise the importance of engaging with stakeholders to understand its context and be in a better and increased competitive edge as they are always abreast of their competition. Latham [16] supports the notion that leadership in quality promotion must recognise that boundaryless organisations require individuals who recognise that people and communities are part and parcel of decision-making in an organisation. Considering people's engagement in organisations, confirms that competent, empowered and engaged people enhance their creation of value.

- **Process approach**: Organisations should manage all activities, tasks and interrelated resources to effectively realise the desired output, including well-defined and controlled internal processes [13]. The process approach also allows organisations that employ a process to identify their needs as inputs to convert them to outputs.

- **Improvement**: Organisations must consistently assess the adequacy and effectiveness of their processes, policies and procedures and, where gaps exist, implement corrective actions to ensure all facets of the QMS realise continual improvement. According to Sadik [7], a firm must go for quality management in their firm in order to gain a competitive advantage. With that said, implementing quality assurance tools such as a quality improvement will ultimately lead to efficient and effective operations. It has been affirmed that quality is improved when such tools are entrenched, leading to 'organisational

improvement, managerial efficiency, and effective management and with that continuously improving productivity' ([7], p. 31).

- **Evidence-based decision-making**: Business decisions should be made based on the results of pertinent information that has been thoroughly examined. Drivers for change, such as managers, must be willing to share their proposals to employees and their associations before making final decisions that will impact the lives of the employees. Managers must provide valid evidence on how certain decisions can be applied in their organisations.

- **Relationship management**: For organisations to ensure effective operations, they rely on suppliers, contractors and other interested parties. Therefore, they should have controlled processes in place to manage them sustainably. Colledani and Tullio [17] believes that organisations shall determine the controls to be applied to externally provided processes, products and services. Constance interaction between organisations and the stakeholders can be a platform to improve relations between the organisation and clients.

As a quality professional with years of experience in auditing and implementing QMS, it has been observed that quality-oriented organisations are the most successful than their counterparts. Their better performance is that standards build confidence to customers that the product, services and processes meet the acceptable requirements, thus increasing customer retention and satisfaction. 'Quality management is the basic tool that leads to quality assurance and will ultimately result in customer satisfaction' ([7], p. 31).

4. Literature review

Existing literature that revealed the benefits enjoyed by certified organisations small, medium and micro-sized enterprises was reviewed and explored to respond to the study's research questions. Different theories were also assessed to test the hypotheses emerging from the research question. Ultimately the theory of Total Quality Management (TQM) was relevant to the research study.

4.1 Theoretical framework of the study

The theoretical framework of this study is limited to three TQM theories by Crosby (1979) and Juran [18]. TQM has been studied from diverse and numerous perspectives. The first theory of TQM by Deming focused on the system of profound knowledge, 14 points of management and the Plan-Do-Check-Act (PDCA) Cycle. For this paper, the focus was on the PDCA cycle as represented in **Figure 2**, considering its direct applicability to the paper. According to Bulsuk [19], a detailed **plan** is the first step in any project, once the plan is in place, **do** (implement) it regardless of its perfect completeness. Then make sure all problems are noted as being encountered and how to respond to them. Bulsuk [19] further explained the next step of the cycle, **checking** to see if any problems have been encountered during the execution of the plan, so that root cause analysis is initiated where deviations are identified. Lastly, to **act** on the identified root causes and implement corrective actions.

The PDCA is popularly referred to as the beginning of continuous process improvement and is used to solve problems to maximise business processes. Kaiser [20] noted how the cycle could guarantee improvements for activity in agreement

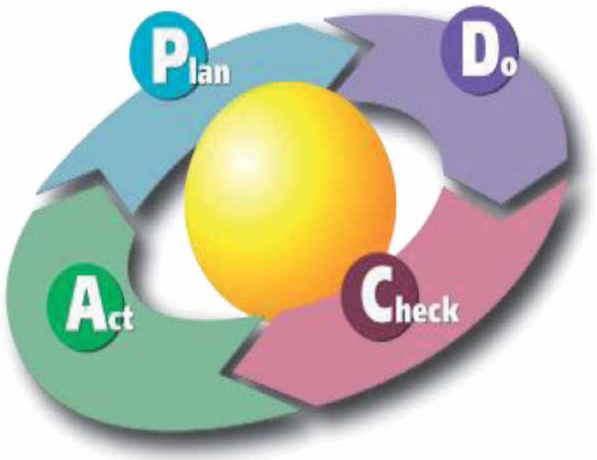

Figure 2.
The first step to plan-do-check-act cycle [19].

with Deming's PDCA cycle, which was conceptualised in 1959. Otterloo [21] believes that the PDCA model was developed to aid improvement in the production processes.

The second theory of TQM by Crosby [18] contributed to TQM by outlining a 14-step approach to quality that demonstrated commitment strategies and principles to continuous improvement in organisations. Another contribution towards TQM can be recognised through another quality guru, Juran (1986), whose third theory of TQM aimed at explaining the concept of Quality Trilogy, namely quality planning, quality control and quality improvement.

As indicated in **Figure 3** below, the TQM process starts with planning activities to ensure all risks associated with the projects are assessed, measured and managed accordingly. Juran ([18], 3) argued that quality planning is the starting point in creating a process that will meet established goals and do so under operating conditions. The planning phase is very critical during the setting of objectives in order to allocate and prioritise the necessary resources to meet customer requirements and specifications, which agrees with Juran's assertion. These theories align with the study and can be applied to understand the significance of quality management systems in business performance.

Figure 3.
TQM theory of quality trilogy ([18], 2).

4.2 Application of quality standards by SMMEs

The objective of this paper is to respond to the critical research question that emerged from the research study. In response to the research question, various scholars affirmed a positive relationship between the application of quality standards and business performance. This link between quality and business performance is confirmed by Savino et al., [22, 23] who cited, Colledani and Tolio [17], and Chi Phan et al. [24], who explored the relationship between quality management practices competitive performance in manufacturing companies. Again, Colledani and Tolio [17] affirm that quality control allows for high product quality standards, reducing wastage and rework.

According to Zhao et al. [25], a quality management system is a set of organised processes desirable for the business product or service to satisfy client, consumer or customer demands. It comprises standards and guides with management systems and specific tools such as auditing methods that should be verified to meet agreed standards. Similarly, according to Bjørg, Granly and Welo [26], the development of international standards resulted in a diversity of models, such as the Acorn method. Zhao et al. [25] assessed the extent to which SMMEs disclosed quality compliance in their organisational strategies. They found several quality disclosure strategies for SMMEs to improve organisational performance and optimise competition in the marketplace. Owens [27] similarly examined the adoption of quality practices in SMMEs and environmental practices in small service companies. They found that 'high-quality SMMEs' have chances of obtaining high profits than the 'low-quality SMMEs', even when customers are aware of the actual quality of a small business organisation.

South African Bureau of Standards (SABS) is governed by the Standards Act, 2008 (Act No. 8 of 2008), which is to develop and review South African National Standards (SANS) for various industrial sectors. Therefore, industries need to adopt these standards to ensure an acceptable level of quality in their operations. SABS Integrated Annual report (2018/19) deduces that applying quality standards assures good quality and performance of products. Some of these standards are adopted by organisations voluntarily; however, most of them are regulated by the National Regulator for Compulsory Specifications (NRCS), which prevents non-compliant products from entering the local markets. The National Regulator governs NRCS for Compulsory Specifications Act, Act No. 5 of 2008, which enforces standards to ensure only confirming products enter the markets. The NRCS, therefore, affirms the importance of product compliance in the South African market. The objective is 'to protect public health, safety and the environment and to promote fair trade, which is achieved through ensuring that businesses produce, import or sell products or provide services that comply with the minimum safety and environment requirements, and do not fall short of the declared measure' ([28], p. 8).

The SABS Integrated Annual report ([29], p. 22) highlighted that while the government needs national standards to catalyse economic activity to achieve societal benefits, it is imperative to support local manufacturers to compete in the domestic and overseas markets. The industry and consumers, in turn, need standards to support innovation, to be protected against poor quality products and to comply with societal expectations by lowering the cost of production. The author is also of the view that standards play a vital role in the public's daily lives. Standards control and manage societies either directly through standards set by individuals or imposed through government legislation. Research findings showed that certified organisations are more successful than their non-certified counterparts. The ISO 9001 [1] standard highlights adopting a quality management system as a strategic decision. This can enhance organisation performance and provide a sound basis for

sustainable development initiatives. The ISO standard further highlights that the potential benefits to an organisation of implementing a quality management system are: a) the ability to consistently provide products and services that meet customer and applicable statutory and regulatory requirements; b) facilitating opportunities to enhance customer satisfaction; c) addressing risks and opportunities associated with its context and objectives; d) the ability to demonstrate conformity to specified quality management system requirements. Potential benefits are elaborated and supported by reviewed literature below:

a. **The ability to consistently provide products and services that meet customer and applicable statutory and regulatory requirements**

Effective implementation of TQM approaches provides customers with confidence that products and services are good quality and safe for performance. Eniola ([2], p. 1) supports the assertion that organisations implement TQM to improve their business success by differentiating their products and gaining a competitive position in the market [30, 31]. The National Regulator for Compulsory Specifications report ([28], p. 9) highlights an action plan to be implemented that will continue to encourage companies to comply with the regulations to bring efficiency into the regulatory processes. The report further highlights that it is highly beneficial for industries to ensure compliance with administrative and technical requirements, as these factors strongly determine companies' risk and turnaround times.

b. **Facilitating opportunities to enhance customer satisfaction**

According to Savino et al. [22, 23], quality has been recognised broadly as one of the critical factors for success in the global market for all kinds of business. 'TQM is the operational management that is used by a firm for better work, and their ultimate aim is customer satisfaction' ([7], p. 31). Also, ISO 9001 ([1], p. 16) standard holds the view that the organisation shall monitor customers' perceptions of the degree to which their needs and expectations have been fulfilled. In another study on customer satisfaction in the airline industry, Madikwe ([32], p. 14) and [33] argued that customer satisfaction is one of the most critical factors for organisations to improve performance. 'A company with good quality practices easily gains trust and interest from existing customers as well as from potential customers' ([34], p. 3). In concurrence with assertions by these scholars and ISO standards, it can be concluded that customer-centric organisations that strive for customer feedback have the potential to retain their customers and are likely to attract potential customers more than their counterparts.

c. **Addressing risks and opportunities associated with its context and objectives**

According to ISO 9001 ([1], p. 4) standard, when planning for an effective business management system, the organisation shall determine risks and opportunities that need to be addressed to give assurance that the management system can achieve its intended results, enhance desirable effects, prevent or reduce undesired effects and achieve business improvement. Alfonsi [35], a corporate legal adviser, argued that a well-defined enterprise risk management (ERM) process framework could protect and create value for organisations and their owners. The author is in concurrence with the assertions mentioned above by Alfonsi as ISO 9001:2015 standard for ERM adoption that can integrate risk management

into their overall business management systems through the setting and planning of business objectives and strategies for optimal performance.

d. **The ability to demonstrate conformity to specified quality management system requirements**

The author is of the view that effective implementation of continuous improvement programmes such as internal audits, management reviews and on the job competency training assessments remain critical in every organisation. The outcomes of these programmes assist in gaps and risks identification in business processes so that necessary corrective actions are implemented. The author believes that initiating quality control processes on the final product through laboratory tests and analysis is imperative for quality confirmation. This view supported by the author is based on a long experience in laboratory work and the author's technical background. According to Buri ([34], p. 14), maintaining quality processes in laboratories can be considered as work to be done in order to conform to requirements and guidelines from standardised and accredited organisations.

5. Research methodology

In order to meet the objectives of the study, both quantitative and qualitative research approaches were employed. However, quantitative approach dominated the study since data was collected using completed quantifiable questionnaires. As part of the qualitative approach, structured interviews were employed to ascertain the validity and reliability of the data gathered. Sekaran and Bougie [36] define mixed methods research as an approach aimed to answer research questions that cannot be answered by 'qualitative' or 'quantitative' approaches alone. 'Mixed methods research focuses on collecting, analysing and mixing both quantitative and qualitative data in a single study or series of studies' ([36], p. 106).

Research questions:

What is the impact of Quality Management on the business performance of SMMEs in KwaZulu-Natal?

The research design explored the correlation between two variables, the impact of quality standards and business performance. Sekaran and Bougie [36] argued that a correlation research design describes how a change in one variable brings about another. This study adopted an exploratory research design defined 'as a valuable means to ask open questions to discover what is happening and to gain acumens about a subject matter' Saunders et al. [37].

According to Pizzo [38], the target population is the group of elements the researcher wants to infer, at least theoretically, the population is finite and can be counted. The study targeted SMMEs from the 10 extensive suburbs and townships within the Durban Metropolitan Area (DMA). Two SMMEs were randomly selected from each suburb to reach a total number of twenty collected samples. In order to meet the objectives of the study, data was gathered using questionnaires from a sample of 20 SMMEs. Two questionnaires were designed and distributed separately to 10 certified and non-certified SMMEs, making 20 altogether.

6. Data analysis and interpretation

In order to meet the objectives of this study, two types of questionnaires needed to be designed and distributed to the targeted groups, namely certified

and non-certified organisations. As part of data gathering, the researcher used the Likert scale methodology to establish agreement or disagreement to the questions and declared statements. Sekaran and Bougie [36] defined the Likert scale as a scale designed to examine how strongly respondents agree with a statement. The survey results have been analysed and interpreted separately to conclude if each research objective has been achieved.

6.1 Data analysis and findings

6.1.1 SMMEs' perceptions of a quality management system on the performance

The first question in the survey was, 'what are the SMMEs' perceptions of a quality management system on the performance of their businesses?' This question used a Likert scale with five options to choose from, ranging from Strongly Agree to Disagree Strongly. The questionnaires designed for certified organisations were different from those of non-certified organisations to ensure that their responses were relevant and interpreted. **Figure 4** below depicts a graphic representation of the responses gathered from the certified organisations.
Out of 10 respondents, 70% of them displayed an extreme agreement with the questions, whilst 30% of respondents showed a firm agreement to the assertion that practical implementation of QMS adds value towards effective operations and business improvements. None of the respondents strongly disagreed nor disagreed.

Similarly, **Figure 5** below depicts the responses by non-certified organisations. Out of 10 respondents, 70% of them displayed an extreme level of agreement, whilst 10% displayed a solid agreement to the assertion that their negative perceptions of the effectiveness of a formalised QMS are due to the lack of awareness of its benefits. Whilst the remaining 20% did not agree to any value add. Based on the survey results, it can be concluded that a positive correlation exists between the application of quality standards and improved business performance, and therefore the hypothesis is true.

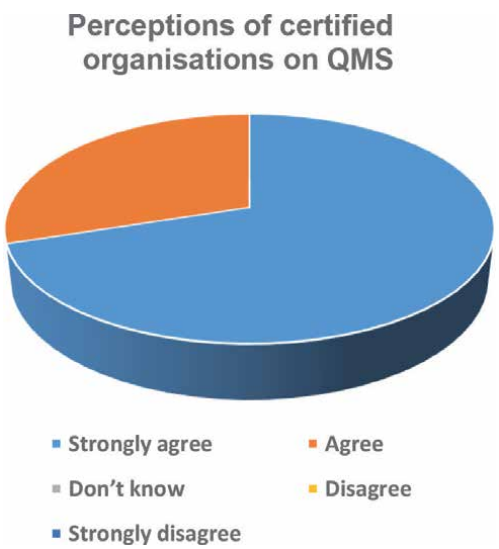

Figure 4.
Represents perceptions by certified organisations.

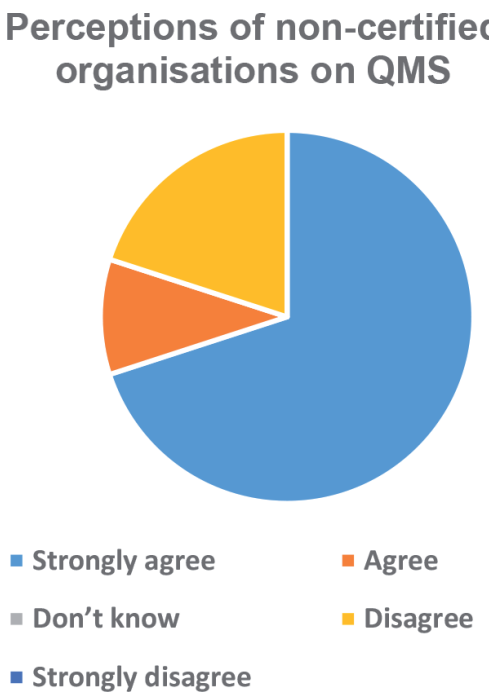

Figure 5.
Represents perceptions by non-certified organisations.

6.1.2 Incentives and the intended outcomes of quality standards on the business performance of SMMEs

The second question in the survey was to assess the incentives and the intended outcomes of quality standards on the business performance of SMMEs. Both certified and non-certified questions were asked the same set of questions to establish their financial status, as indicated in **Figure 6** below. The graphic representation in **Figure 6** depicts the responses by both certified and non-certified organisations on their annual revenue for the past three financial years.

From the survey results, a positive economic impact on the application of quality standards has been confirmed by certified organisations. Growth and sustainability of the annual revenue of certified organisations from 2015/2016 to 2017/2018 and

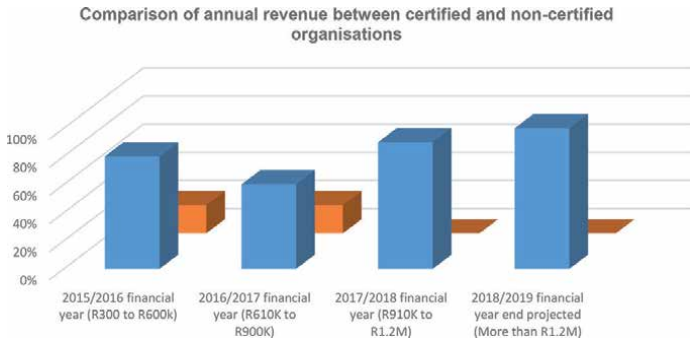

Figure 6.
Represents the annual revenue between certified and non-certified organisations.

the projected revenue for 2018/2019 were evident compared with the revenue situation of non-certified organisations. Considering both organisations' annual revenue survey results, it can be concluded that the application of quality standards to business processes and practices has a positive impact on business performance. Therefore, the research hypothesis is that quality standards' incentives and intended outcomes positively relate to optimal organisational performance.

6.1.3 Barriers and challenges contributing to the stagnant business growth of SMMEs

The third question in the survey was, 'what are the barriers and challenges contributing to the stagnant business growth of SMMEs?' A summary of the challenges that impact effective operations and business growth experienced by SMMEs is depicted in **Figure 7** below. These identified challenges have been categorised into four aspects: marketing and competitiveness, skills and opportunities, finances and proper infrastructure. The survey results show that non-certified organisations are more negatively affected by these challenges than their counterparts. About challenges relating to marketing and competitiveness, only 35% of the respondents in certified organisations are affected, whilst 65% of them confirmed to have no market accessibility issues.

Most respondents in non-certified organisations are faced with challenges relating to proper infrastructure, finances, marketing and competitiveness. These very crucial challenges are to be surmounted by all organisations in pursuit of accreditation acquisition. Due to financial constraints, non-certified organisations cannot compete globally, hence placing them in a disadvantageous position. Competitive advantage denotes the relative higher position in the market that leads a firm to surpass its rivals in terms of revenues ([7], p. 3). Standards have also been essential to get recognition from demanding regional and global retailers Gerundino [39]. Based on the survey results and the assertions by Gerundino and Mohamed, it can be concluded that global competitiveness is one of the benefits that certified organisations have as a result of their consistent level of quality and therefore their ability to penetrate larger markets, which is essential for business expansion and sustainability.

6.1.4 Knowledge of relevant industry regulatory and statutory requirements

The fourth question in the survey probed participants to indicate whether they knew relevant industry regulatory and statutory requirements of quality standards

Figure 7.
Represents a comparison between challenges facing certified and non-certified organisations.

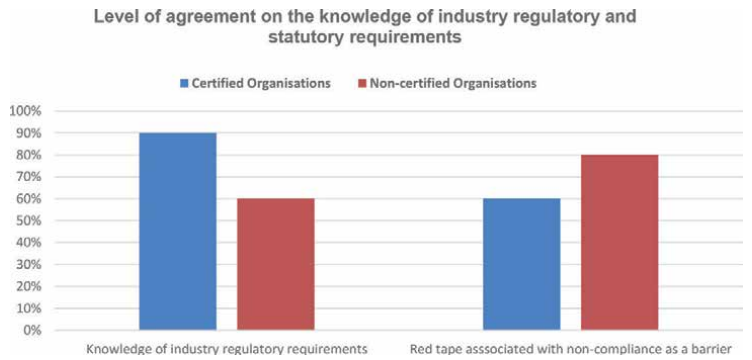

Figure 8.
Represents the level of agreement on the knowledge of relevant industry regulatory and statutory requirements.

or not. This question used a Likert scale with five options to choose from, ranging from Strongly Agree to Disagree Strongly. The questions were designed to respond to the level of awareness on industry regulatory requirements and red tape barriers associated with noncompliance. **Figure 8** above is a graphic representation of the responses from both certified and non-certified respondents about the knowledge of relevant regulatory and statutory requirements that govern their industries.

The application of standards supports good regulatory practices and efficient implementation of public policies Gerundino [39]. Research results revealed that 90% of the respondents of the certified organisations are very much aware of their industry regulatory and statutory requirements compared with 60% of the respondents of the non-certified organisations. Similarly, certified organisations are less affected by the red tape associated with noncompliance than non-certified organisations. If adequately applied, standards positively impact the economy as they support creativity and innovation, thus enhancing more opportunities for new product development and R&D. According to Muringani ([40], 111), the intended outcomes of innovation in small firms are either enhanced business or operational performance or both. In the former, the production of goods, services and profitability are primary, and in the latter, the overall desirable combined outcome is cost reduction and customer satisfaction. The impact of noncompliance to standards and lack of good regulatory practices contribute to the sub-standard performance of SMMEs.

7. Policy implications

The study has observed that the majority of SMMEs in the informal economy are trading food without a valid certificate of acceptability, which serves as a minimum requirement as stipulated under Regulation 638 (2018:8). The S.A.'s Food Safety Regulation R638 of 2018 Section 3(1)(a) (2018:8) provides for regulation and compliance of how the Food Safety Regulation must apply. However, the government needs to go back to the drawing board and identify the gaps in policy implementation. It is a priority for the government to invite all stakeholders to submit policy changes regarding the compliance of SMMEs in adopting and practising quality management. Any shift in government policy decisions regarding quality management will implicate the cost of educating and training SMMEs on the new provisions for compliance with quality management requirements. Some entrepreneurs are already struggling to sustain their businesses. It is a challenge for them to expand their operations and functions to accommodate a quality management system.

To receive quality compliance certificates, SMMEs must train staff to perform better and get valid certificates of acceptability, they sometimes do not have these certificates. The SMMEs are challenged since they do not have compliance all the time. Affected parties must develop strategies that can address the noncompliance of SMMEs in quality assurance and management. Most respondents in non-certified organisations are faced with challenges relating to proper infrastructure, finances, marketing and competitiveness. The SMMEs will need money to address their challenges of accreditation acquisition by upgrading infrastructure and finances, marketing and competitiveness. These very crucial challenges are to be surmounted by all organisations pursuing accreditation acquisition. Managers will have to align their operational units with TQM.

Managers can draft internal quality policies to drive compliance in the organisations. Having a quality management policy can alleviate risk and uncertainty during the implementation of operational principles and practices. The use of quality practitioners can be used to support non-quality management functions. The use of a structured and predetermined implementation plan can be an added advantage, especially if it is shared across all units of SMME. This can imply the company is supporting to benefit employee involvement and effective policies.

8. Conclusions and recommendations

8.1 Conclusions

The chapter revealed a positive relationship between the application of quality standards and improved business performance. It also affirmed the hypothesis that SMMEs are aware of the barriers and challenges affecting the growth of their businesses, which principally stem from non-compliant products and services which do not meet quality requirements. The literature reviewed supported these findings, which also indicated that certified SMMEs are keen to comply with quality standards and improve their performance. Hence they are more successful than their counterparts. Other SMMEs interested in improving their performance can learn from this case and comply with quality standards. Certification of SMMEs can also be viewed as a strategy to improve the operations of the SMMEs, especially when they align their operations with the principle of total quality management. It can add value if other SMMEs can follow suit by registering their business to comply with TQM to improve their performance quality standards in their business operations.

In conclusion, the response to the main research question that emerged showed a relationship between quality standards and positive outcomes. Thus, the hypothesis suggesting that the application of quality standards positively impacts business performance proved to be true.

8.2 Recommendations

In responding to the critical research question, the research findings confirmed a positive impact of applying standards on the business performance of SMMEs. To deepen the knowledge on the subject matter, recommendations for further study were suggested as follows:

- The government must prioritise accreditation acquisition for SMME development in combating barriers associated with compliance and quality assurance.

- SMEEs must monitor and evaluate their interventions supported by the government to ensure the sustainability of its interventions.
- There is a demand and need to enhance assessment for product certification.
- The role of government must be visible in regulating quality standards to promote fair competition.

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Global Trade in the Emerging Business Environment explores global trade dynamics in the emerging business environment. Globalization, technological advancements, Industry 4.0, China's Belt and Road Initiative, and the COVID-19 pandemic are changing the global trade ecosystem. Companies and countries need to evaluate these rapid changes and adjust their respective business strategies and policy formulations. This book discusses such strategies and how firms and countries can reposition themselves within the current environment.

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