INTERNATIONAL UNIVERSITY LIAISON INDONESIA

Assignment Letter / *Surat Tugas*

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Doc Type.	Main Document	**Page**	1 of 1

Dr. Samuel PD Anantadjaya, B.Sc., M.B.A., M.M.

Assignment of Community Service
INTERNATIONAL UNIVERSITY LIAISON INDONESIA

Penugasan Pengabdian Masyarakat Pada
UNIVERSITAS LINTAS INTERNASIONAL INDONESIA

Rector of International University Liaison Indonesia.

Rektor Universitas Lintas Internasional Indonesia.

In consideration of:

His appointment as the Rector of International University Liaison Indonesia under agreement No. SK/015/Y-IULI/X/2019

Mengingat:

Pengangkatannya sebagai Rektor Universitas Lintas Internasional Indonesia dibawah perjanjian No. SK/015/Y-IULI/X/2019

Herewith gives the task to:

Dengan ini menugaskan kepada:

Name: **Dr. Samuel PD Anantadjaya, B.Sc., M.B.A., M.M.**

Position: **Dean**

Nama: ***Dr. Samuel PD Anantadjaya, B.Sc., M.B.A., M.M.***

Jabatan: ***Dekan***

To review on the following article:

Untuk mengulas artikel seperti berikut ini:

No	Task / Tugas	Organizer / Penyelengara	Period / Periode	Detail / Detil
1.	Review Article with the title: Impact of Institutions and ICT Services in Avoiding Resource Curse: Lesson from the Successful Economies	Journal: Heliyon ISSN #2405-8440 Organizer: Samir Amine-Associate Editor Business & Editor	Sept 24th-Oct 8th, 2020	Publisher: Science Direct by Elsevier, BV Printing Company: CellPress

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Assignor/*Pemberi Tugas:*

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Rector / Rektor

Organizer's Signature & Chop/*Tanda tangan dan Stempel Penyelenggara*:

the review activities and comments are attached below

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ISSN # 2405-8440
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Invitation to review for Heliyon

1 message

Heliyon <em@editorialmanager.com> Thu, Sep 24, 2020 at 5:43 PM
Reply-To: Heliyon <info@heliyon.com>
To: Samuel PD Anantadjaya <ethan.eryn@gmail.com>

Manuscript Number: HELIYON-D-20-06441
Impact of Institutions and ICT Services in Avoiding Resource Curse: Lessons from the Successful Economies
Birku Reta Entele, PhD

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Kind regards,

Samir Amine
Associate Editor - Business & Economics
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Abstract:
The study investigates why some resource-abundant countries are not successful while others are; focusing on the role of institutions and ICT service perspectives. By employing the panel data from 1995-2019, the researcher estimated the fixed effect panel model and 3SLS to capture the endogeneity problem. The result shows natural resource abundance and institutional performance have a significant negative effect on economic growth in the case of resource curse economies. However, these economies have the potential to escape the resource curse given they able to build quality of institutions and adopt ICT services. Implications of the study are: (1) the unsuccessful economies should build good institutions to be able to escape the curse. (2) The unsuccessful economies should invest on ICT services to innovate capable institution, which enables to play the game appropriately, and (3) the unsuccessful economies need to work on resource ownership right and governances to
smoothly manage and convert into a source of economic growth

Keywords: economic growth; Institutions; ICT services; Resource curse

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Heliyon

Impact of Institutions and ICT Services in Avoiding Resource Curse: Lessons from the Successful Economies

--Manuscript Draft--

Manuscript Number:	HELIYON-D-20-06441
Article Type:	Original Research Article
Section/Category:	Business and Economics
Keywords:	Economic growth; Institutions; ICT services; Resource curse
Abstract:	The study investigates why some resource-abundant countries are not successful while others are; focusing on the role of institutions and ICT service perspectives. By employing the panel data from 1995-2019, the researcher estimated the fixed effect panel model and 3SLS to capture the endogeneity problem. The result shows natural resource abundance and institutional performance have a significant negative effect on economic growth in the case of resource curse economies. However, these economies have the potential to escape the resource curse given they able to build quality of institutions and adopt ICT services. Implications of the study are: (1) the unsuccessful economies should build good institutions to be able to escape the curse. (2) The unsuccessful economies should invest on ICT services to innovate capable institution, which enables to play the game appropriately, and (3) the unsuccessful economies need to work on resource ownership right and governances to smoothly manage and convert into a source of economic growth

Impact of Institutions and ICT Services in Avoiding Resource Curse: Lessons from the Successful Economies

Abstract

The study investigates why some resource-abundant countries are not successful while others are; focusing on the role of institutions and ICT service perspectives. By employing the panel data from 1995-2019, the researcher estimated the fixed effect panel model and 3SLS to capture the endogeneity problem. The result shows natural resource abundance and institutional performance have a significant negative effect on economic growth in the case of resource curse economies. However, these economies have the potential to escape the resource curse given they able to build quality of institutions and adopt ICT services.

Keywords: *Economic growth; Institutions; ICT services; Resource curse*

1. Introduction

Natural resources can be used as factors of production in the domestic industry and as a primary commodity export to earn foreign currency, particularly in developing countries. At least in either of the case, it adds capital accumulation and increases the economic growth of the nation endowed with abundant resources. For instance, countries such as Canada, Norway, Australia, and the United States significantly depend on the export of primary commodities during the early economic development stage (North and Thomas, 1973; Auty and Mikesell, 1998) [1, 2]. However, after the 20th century, the role of natural resources considered less important than the role of labor and capital in generating economic growth. Even on the other hand, there is much-growing evidence, which suggests that natural resource abundance may be dangerous to the economic growth of low-income countries. This kind of argument brings the so-called resource curse puzzle (Sachs and Warner, 1995) [3]. For instance, to investigate the economic growth rate and share of natural resources in the economic growth rate of some countries, the correlation between per capita GDP growth rate and the average natural resource rent as a percentage of their GDP for some few countries are plotted as Figure 1.

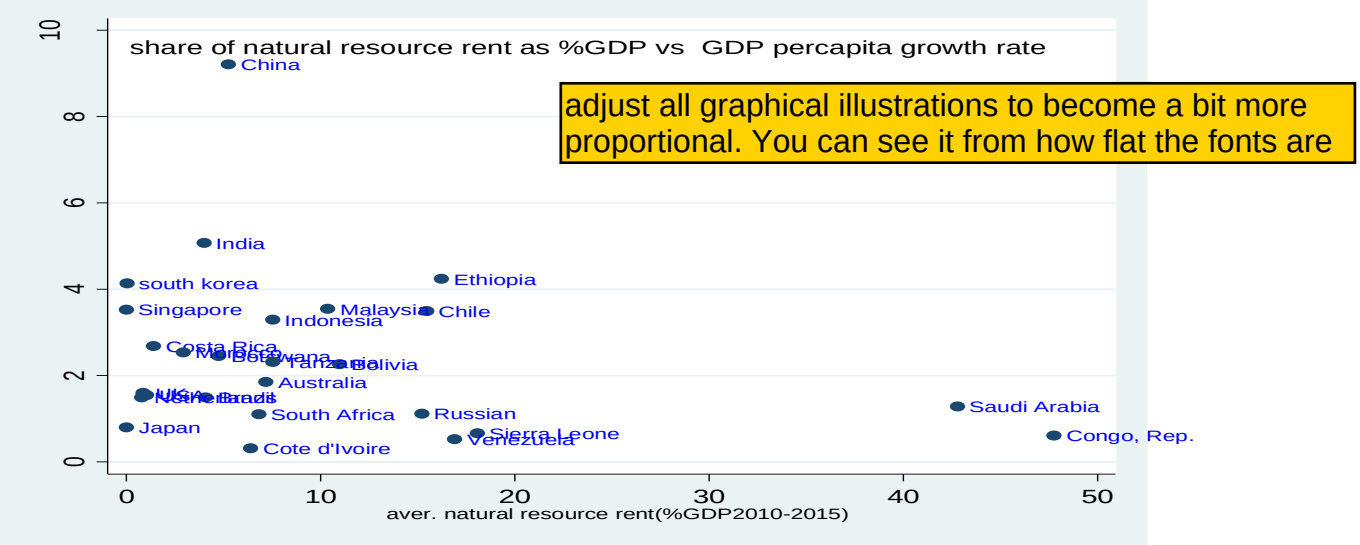

Figure 1: GDP per capita growth rate vs Percentage share of natural resource rent to their GDP

From Figure 1 above, we observe that countries with high natural resource rent as a percentage of their GDP have low GDP per capita growth rate such as Congo Republic, Saudi Arabia, Venezuela, Sierra Leone, Cote d'Ivoire, etc. On the other hand, we observe that countries with high natural resource rent as a percentage of their GDP have high GDP per capita growth rate such as Chile, Botswana, Canada, etc. Hence, the disparity raises a question of why some resource-abundant economies succeeded while others do not. Furthermore, to get a clear picture of the disparity between the countries, the annual trends of

natural resource rent as a percentage of their GPD for the countries considered in the study are drawn as in Figure 2.

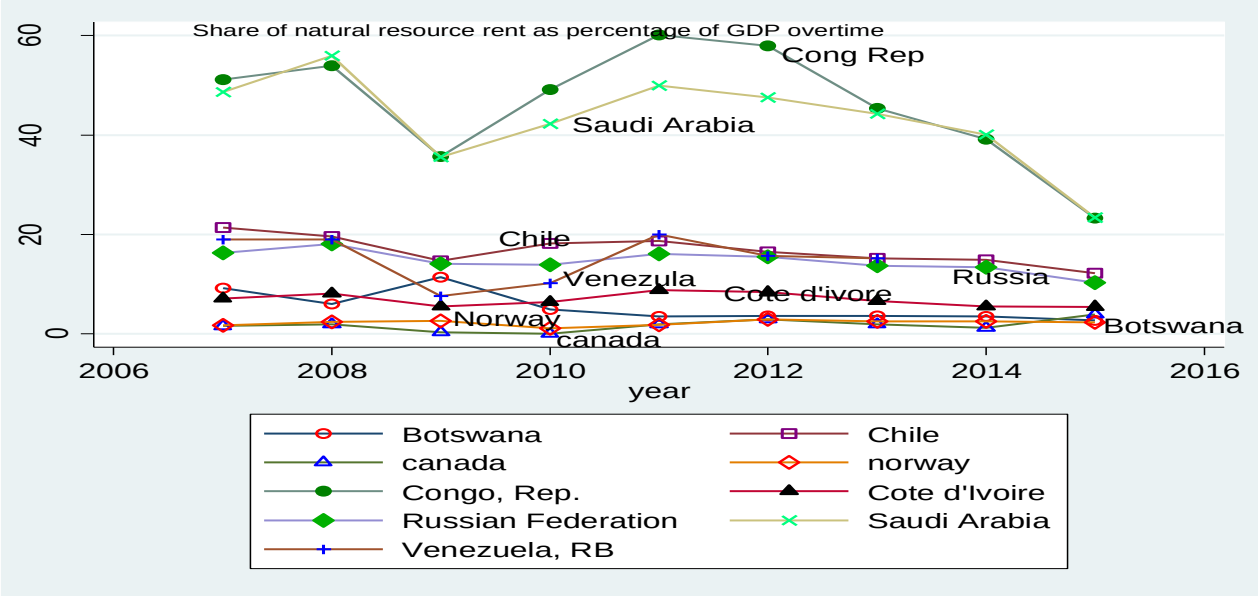

Figure 2: Trends of natural resource rent contribution as a percent of their GDP

Figure 2 above shows that the highest percentage share of natural resource rent to their GDP over time are countries such as Congo and Saudi Arabia while they have the lowest economic performance in contrarily compared to the other countries in the study. Therefore, the research question is why some resource-rich countries are not successful while others are successfully succeeded. Different previous studies have investigated the contributions of institutions to overcome resource curse problem, but no studies have investigated the role of information communication technologies (ICT) in bridging and strengthening the institutional gap and accelerate economic growth via avoiding resource curse problem yet.

According to the World development report of 2016, ICT can create inclusion, efficiency, and innovation World Bank group (2016) [4]. The adoption of ICT services into firms and public service institutions is an innovation since it has significant improvement in productivity and overall efficiency. Furthermore, ICT affects economic activities from both supply and demand sides. In the demand side, the consumer's economic behavior through utility function and in the supply side on the producer's behavior through productive function will be affected. In the supply side, ICT associated with other complementary infrastructure components resulted in capital deepening, and reorganization of economic processes and ultimately increasing the economic growth and productivity of productive factors in developing countries.

Since ICT products and services are both outputs from the ICT industries and inputs into ICT-using industries, it can impact economic growth through four major channels (Jalava and Pohjola 2007) [5]":(i) Production of ICT goods and services which directly contributes to the aggregate value-added generated in an economy, (ii) Increase in productivity of production in the ICT sector which contributes to overall productivity in an economy (TFP); (iii) Use of ICT capital as in input in the production of other goods and services, (iv) Contribution to economy-wide TFP from an increase in productivity in non-ICT producing sectors induced by the production and use of ICT (spillover effects) [6]. For instance, African firms that use IT service increases productivity compared to non-users (Cirera, Lage, and Sabetti, **2016**) [7]. Concerning institutions, the contribution of ICT to business institutions, the democratization process, and public service institutions are: ICT augments business institutions via a cross-border flow of information, promote international trade, and help to attract foreign direct investment. ICT also helps the democratization process, by fostering good governance and streamlining bureaucratic procedures through intra-governmental networking and by reducing corruption. And finally, ICT augments public service institutions, such as the areas of e-government, e-health service, e-education, environmental protection, licensing, controlling, and other sectors too [4]. Even in the case of external shock and disaster to the economies, the role of ICT in controlling the situations and survival is of paramount importance. For instance, in the case of pandemic Novel Coronavirus (COVID_19) outbreak, countries with better ICT infrastructure could be able to minimize the potential effect of the virus on their economic activities via working at home, teaching and learning online and online service delivery compared to countries without enough ICT infrastructure.

Therefore, given the potential contribution of ICT to the country's economic growth and institutions, this study assumes ICT adoption as an innovation in the resource-abundant but cursed countries. In addition to building human capital, the adoption of ICT helps to augment labor and capital productivity and strengthening institutions.

To realize and obtain objective evidence for the aforementioned research questions, the study investigates factors behind explaining why some resource-rich countries are not successful while others are. From institutional and ICT service perspectives, the specific objectives of the study are; (1) to identify the role of the institution in avoiding resource curse problem, (2) to investigate the role of ICT service (digital technologies) in strengthening institutions and avoiding resource curse problem, (3) to identify the threshold level of institutional quality and ICT services to overcome resource curse problem, and finally, (4) to review the successful countries policies which can be a lesson for resource curse countries

The organization of the study is as follows: Section one is all about the introduction part including research questions and objectives. The next section is a literature review that summarizes previous research output related to the topic, followed by section three which is the methodology part. Section four discusses results and analysis and, section five presents conclusion and policy implications.

2. Literature review

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Many speculations have been said concerning the natural resource abundance curse from different perspectives and conditions. Some of the theories explain the channels of effects of the resource curse is discussed below.

The Dutch disease theory hypothesizes that an endowment of natural resource abundance leads to a decline in other sectors' development for their economic growth rather depends on the windfall resources [8]. This leads to declines in the production and export of the manufacturing sector which has a high global value chain and which could make an economy benefited more than exporting the primary commodity. Hence, this leads to a decline in investment in human capital which is more important for economic development in the long run and hence leads to a decline in a country's competitiveness. According to (Burnside and Dollar, 2000) [9], the damaging consequences are even worse if resources are used for consumption instead of investment for future return.

The rent-seeking synthesis problem may also emerge in resource abundance countries particularly if their institutions are weak. Torvik (2002) suggests that firms in resource-abundant countries have a high probability to engage in rent-seeking activities, leaving only a few to engage in productive ventures [10]. Such rent-seeking behavior is more common in economies with low institutional quality because they are less likely able to attract entrepreneurs into productive activities than are good institutions (Tornell and Lane (1999)), and Mehlum *et al.* (2006a) [11, 12]. The problem of rent-seeking behavior and weak institution is the reflection of the extent of the practices of governance. Governance is the process whereby organizations or resources are managed with the insurance of participation, transparency, accountability, and the rule of the law which determines the path for sustainable change (Sheng, 2009) [13]. Thus, good governance is how the effective interactions of the state civil society and the private sector take place. The practices of good governance lead to more efficiency, economic growth and development, effective and efficient service delivery to the public, and fighting corruption (Gisselquist, 2013) [14]. Hence, the role of institutions in shaping economic behavior and utilizing economic resources is important. In addition to these two theories, there are also different

ensure to have the same size of font used & run the spell check prior to submissions

arguments by different scholars broadly categorized into those who say resource curse existed unconditionally, and those who argue the resource curse is conditional.

Some of the authors such as Sachs and Warner (1995) [3] assume the existence of unconditional resource curse which means that presence of correlation between resource abundance with a measure of economic development without accounting for other social, and economic and institutional factors that may affect this relationship. But this argument is not more convincing since it fails to explain why economies such as Botswana, which is rich in diamond, is not resource cursed while Sierra Leone, which is also rich in diamond but does appear to be cursed. Another example may be Norway and Nigeria, in which both countries are endowed with abundant oil, but have different economic and living standards status. Norway had able to properly utilize its resources and become the world's richest economies while Nigeria is notorious for its mismanagement of resources, corrupt tendencies, and low economic growth (Sala-i-Martin and Subramanian, 2003) [15].

Other arguments focus on divergent growth experience of countries, despite similar resource type and abundance [Mehlum *et al.,* 2006b; Arezki and Van der Ploeg, 2007; Boschini *et al.,* 2007; Humphreys *et al.,* 2007][12,16,17,18]. These researchers have identified that the quality of institutions is the main channel through which natural resources can be extracted and affect economic growth. Hence the resource abundance countries have the potential to escape the resource curse given that they have capable institutions. Therefore, the main point of this argument is that "the stylized facts that natural resource abundance is bad for growth should be abandoned" Lederman and Maloney (2007), instead, suggest that this should be understood under what circumstances the resources curse does and does not hold [19].

From technology to institutions and economic growth perspectives, studies on the role of ICT in affecting institutions and economic growth reveals a positive contribution in the case of developed countries. However, there is a growing consensus among economic growth theorists and development specialists that technology innovation and diffusion can play a critical role in stimulating economic growth and productivity [20]. Economists such as Arthur [21] and Romer [22] have emphasized technological innovation in explaining economic growth and productivity gains. Romer [22] argues that economic growth and technological change are inextricably linked. Thus, widespread technology diffusion creates the possibility of increasing returns to investment [4]. A study by Halla, et al, (2013) find that R&D and ICT are both strongly associated with innovation and productivity, with R&D being more important for innovation, and ICT investment being more important for productivity [23]. Another study by Sapprasert, K. (2010), shows that the role of ICT on economic growth is positive and significant [24]. On the other hand, a study by Veeramacheneni, B et al (2007) reveals that there is two-way causality between ICT and economic growth in countries considered in the study [25]. Yet, this does not necessarily imply that just

the framework of thinking, mindset & the Hofstede's cultural index play a crucial role in the process of adapting & adopting the ICT in the resource-abundance countries, such as; Saudi Arabia & Qatar, perhaps.

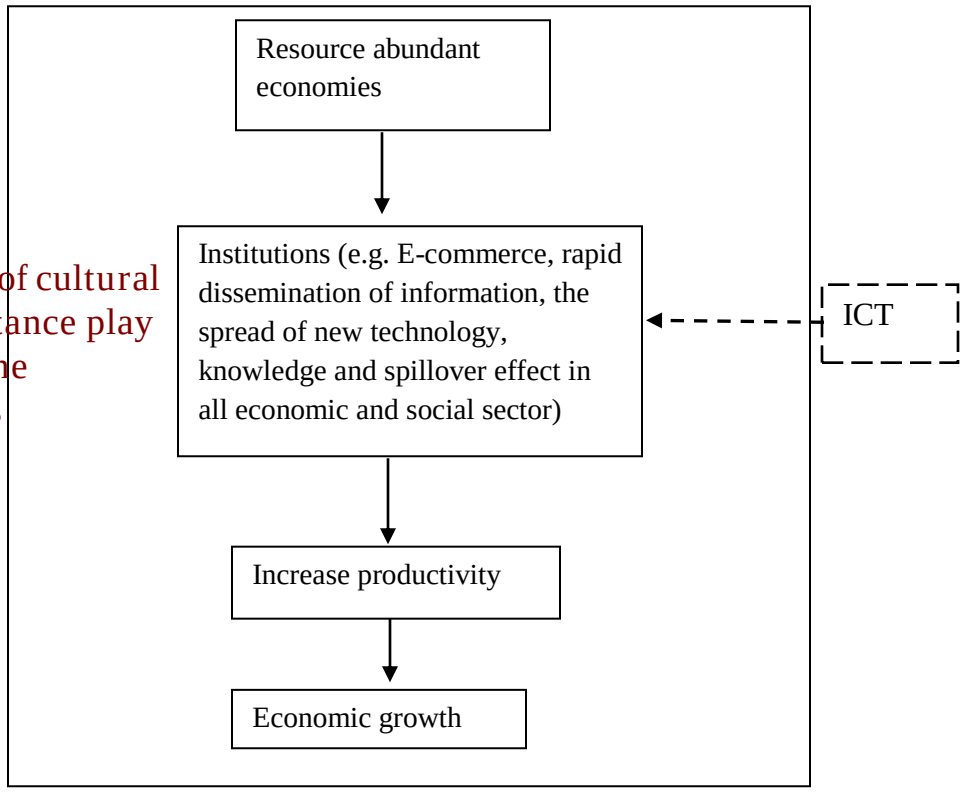
having ICT services is a guarantee to have better economic growth. For example, countries like Saudi Arabia, Qatar, and others have good ICT infrastructure, but could not be able to build good institutions complementing with human capital. The overall point is that the adoption of information communication technologies has a potential effect to strengthen institutions and good governance via accelerating competitiveness, reducing transaction costs, creating efficiency, and then bringing productivity and growth.

Another problem arises from precision to estimation techniques and found no evidence of the unconditional resource curse. Using the same cross-country OLS empirical methodology for the conditional resource curse also incorrectly predicted that all resource abundance economies are destined to be cursed. Hence by using a panel estimator, this problem can be solved (Islam, 1995) [26]. Hence, this study adopts the later argument and investigates the extent of institutional quality and ICT service investment, helps countries to escape the resource curse problem. By doing so, this paper supplements few studies by Anderson and Aslaksen (2008), and Bakwena et al (2009) [27, 28] consider the role of the institution's performance on economic growth, adding additional technology variables and different models.

Theoretically, the study basis on the Resource-based and knowledge-based theory of institutions. The resource-based theory of firms/institutions emphasizes that the correct choice of combination of the resources of a firm may reposition the firm and enhances it to reach a competitive advantage. To gain a competitive advantage, a firm needs to possess specific resources, competency, and capabilities that are valuable, scarce, and durable (Spender 1996) [29]. Hence, one of the resources can be ICT. According to the knowledge-based theory of institutions, the primary role of the organization is rather an application of knowledge (Kogut and Zander 1992) [30]. This is where information technology can play a major role in effectively applying existing knowledge to create knowledge and take the first steps toward forming a competitive advantage (Alavi and Leidner 2001) [31]. For instance, the role of ICT in education sectors, the health sector, the agriculture sector, the public service sector, and all other sectors are significant. Therefore, this study argument is that institutions become stronger given they have digital technologies (ICT) that enable them to run the game the particular institution supposed to play. Hence, ICT services can have the power to equip and strengthen institutions if they properly use it. ICT may have strong influences on institutional quality and performance, which directly influence the growth rate of the economy. Particularly internet service reduces the transaction cost of public and privates services, saves time, and facilitates innovation by small enterprises by easing information access. Therefore, based upon these theories, the study investigates the role of digital technologies (ICT) in building strong institutions and enhancing economic growth in different resource-abundant countries. The framework of information

it appears that the discussions on ICT vs. the actual implementation of ICT across industries/organizations and countries are 2 different stories. The level of human resources readiness and employee resistance may have to be included and/or considered

communication technology service contributions to institutional quality and economic growth is as follows:



the presence of cultural index & resistance play roles inside the organizations

Figure3: Conceptual framework of the study

the hypotheses should be reflected in the research model. Hence, it is important to show the research model (to include the hypotheses)

2.1. Hypotheses of the study

Based on the conceptual model, Figure 3, the study proposed four hypotheses to be tested as below.

H1: Natural resources (as factors of production and source of income) have a significant positive effect on economic growth throughout the models.

H2: The interaction term of natural resource with institutions will have a significant positive effect on economic growth throughout the models

H3: The adoption of ICT service is expected to have a significant positive effect on economic growth throughout the models.

H4: The interaction term of ICT service use and institutions is expected to have a significant positive effect on economic growth throughout the models

3. The methodology of the study

3.1. Source of the data

The study uses secondary data from the World Bank data set that covers from 1995 to 2019 (25 years of data). For this study, nine countries are selected based on their gross domestic product (GDP) share of the natural resource level. Four among the nine countries are resource-rich successful countries such as Botswana, Chile, Canada, and Norway and the remaining five countries are resource-rich countries yet unsuccessful economies such as Congo Republic, Cote d'Ivoire, Russia, Saudi Arabia, and Venezuela.

3.2. Model

To capture the conditional convergence (using a logarithm of initial percapita income level) such as empirical studies by Mankiw et al (1992)[32], the study adopts the framework of Mehlum *et al.* (2006b) and Boschini *et al.* (2007) and chooses a growth rate framework than a level-based framework. Hence using panel data (of 25 years) with different variables such as natural resource, ICT and institutions, and others, the growth rate is modeled as follows:

$$g_t = \beta_0 + \beta_1 \log RPCGDP_{i,0} + \beta_2 L_{i,T} + \beta_3 K_{i,T} + \beta_4 NR_{i,T} + \beta_5 INSTQ_{i,T} + \beta_6 ICT_{i,T} + \beta_7 (NR_{i,T} * INSTQ_{i,T}) + \beta_8 (INSTQ_{i,T} * ICT_{i,T}) + \varphi X_{i,T} + \varepsilon_{i,T} \quad (1)$$

in words, it becomes "the growth rate equals to the real capita GDP + human capital + non-ICT capital + natural resources + institutional quality + ICT + interaction between natural resouces & institutional quality + interaction between institutional quality & ICT

Where $g_t = \frac{\log RPCGDP_{i,T} - \log RPCGDP_{i,0}}{T}$ is economic growth rate from 0 to T years interval, $RPCGDP_{i,T}$ is real per capita GDP at year T, $RPCGDP_{i,0}$ is real GDP per capita at year 0, $NR_{i,T}$ is resource abundance at time T (natural resource rent as a percentage of GDP), $INSTQ_{i,T}$ is the institutional quality, $ICT_{i,T}$ is the amount of ICT capital expenditure, $K_{i,T}$ is the non-ICT capital, $L_{i,T}$ is human capital, $NR_{i,T} * INSTQ_{i,T}$ is the interactions terms of resource-abundant indicator and institutional quality level, $INSTQ_{i,T} * ICT_{i,T}$ is interaction terms of institutions and ICT capital investment, and $X_{i,T}$ is set of other explanatory variables such as investment, domestic credit to the private sector, inflation, openness, and regional dummies.

From the model 1above, the marginal partial impact of an increase in natural resources on economic growth is derived as follows:

$$\frac{\partial g}{\partial NR} = \beta_4 + \beta_7 INSTQ$$

Now, the resource curse hypothesis implies that $\beta_4 < 0$ whereas the quality of institutions that enable to alleviate the resource curse problem implies that $\beta_7 > 0$. In general, the resource curse will be get rid of when the coefficient of institutional quality is greater than the ratio of resource impact over institution impact ($-\beta_4/\beta_7$) i.e. $\beta_4 + \beta_7 INSTQ \geq 0$.

Concerning the partial impact of an increase in institutional quality on growth can be derived as follows

$$\frac{\partial g}{\partial INSTQ} = \beta_5 + \beta_7 NR_{i,T} + \beta_8 ICT$$

From this equation, an economy has an institutional curse if that $\beta_5 < 0$ (which implicitly shows weak institutions, incompetency, corrupt, rent-seeking behavior, etc.) whereas the adoption of ICT services that enable to alleviate or strengthen the institutional quality implies that $\beta_8 > 0$, assuming other things are normal. Besides, natural resources should also need to have a positive impact on economic growth (in not resource curse case) which implies $\beta_7 > 0$. Hence, the institutional curse will be eliminated when the influence of the sum of ICT service and natural resource is greater than the ratio of $(-\beta_5/(\beta_7 + \beta_8))$ which means, $\beta_5 + \beta_7 NR_{i,T} + \beta_8 ICT \geq 0$

Another interesting variable of this study is the partial impact of ICT services on economic growth that can be derived as follows:

$$\frac{\partial g}{\partial ICT} = \beta_6 + \beta_8 INSTQ$$

From this equation, the ICT service curse implies that if $\beta_6 < 0$ (if ICT service does not add any value to the economic growth of a nation), whereas the quality of institutions that enables or converts ICT services to a useful application implies the value of $\beta_8 > 0$ assuming other things are normal. Hence, the ICT service curse will be eliminated when the influence of institutional quality is greater than the ratio of $(-\beta_6/\beta_8)$ which means, $\beta_6 + \beta_8 INSTQ \geq 0$ However when both $\beta_6 > 0, \text{and } \beta_8 > 0$ there is no ICT service curse at all i.e. ICT service increases the efficiency of services, innovation, and productivity and eventually increases economic growth.

The variables and data used in the estimation of the model is extracted from the World Bank database[1] and explained as follows. To capture the natural resource abundance, the study uses natural resource rent as a percentage share of GDP. This is because instead of using the percentage share of primary exports which doesn't show the stock of natural resource, rather it may show the economic structure of the nation, as stated by Bakwena et al(2009)[33], this study uses natural resource rent as a share of GDP.

To measure institutional quality, the study considers the combination of legal institutions (just using property right index), political institutions (focusing democratic index, corruption perception index) and economic institutions (index of economic freedom, regulatory index) which called country's policy and institutional assessment (CPIA) index by World Bank report. The lowest index is zero and the highest index is ten, which shows the lowest institutional quality and the highest institutional quality respectively. The highest property rights index, the better the institutions. The other interesting variable of the study is the role of ICT service in strengthening overall institutional quality, which influences the economic growth of the country. Therefore, the ICT service variable is captured by the amount of ICT capital investment in each economy as a proxy. Transforming the data into a logarithmic form the ICT investment is incorporated as an explanatory variable and used as an interaction term with an institutional quality variable. Other interaction terms used in this study is resource abundance with institutional quality to measure the role of a natural resource on economic growth relative to the different institutional quality index.

Other macroeconomic variables considered in the study are real GDP per capita growth, which is the dependent variable, and initial period real GDP per capita, which is an independent variable to measure the existence of convergence or not according to neoclassical growth theory. Other macro-economic variables considered in the model are level of openness of the economy measured by export plus import to GDP ratio (trade openness), labor input ($L_{i,T}$ is human capital), non-ICT capital investment ($K_{i,T}$) as a percentage of GDP, amount of domestic credit to private investment (to show a degree of privacy in the market), an inflation rate that captured by GDP deflator (include both consumer and producer price index).

4. Results and Analysis

4.1. Descriptive Analysis

The study tries to consider economies that reveal characteristics of both successful and unsuccessful but resource-abundant economies. The average real GDP growth rate for resource-rich successful nations is higher than that of resource curse economies, whereas the average natural resource share of their GDP is

[1] https://databank.worldbank.org/reports.aspx?source=2&series=NY.GDP.DEFL.KD.ZG#

lower than that of resource curse countries. Furthermore, the average non-ICT investments as a percentage of GDP, openness as a percentage of GDP, average ICT capital investment, and other macroeconomic variables are summarized as Table1 below.

Table 1: Resource and economic growth summary (from 1995-2019 years)

Group of economies	Economies	GDP per capita growth	Average non ICT Investment (%GDP)	Openness (%GDP)	Average patent application (number)	Average natural resource rent (%GDP)	Aver. ICT investment (in million US $/year)	E government development index (EGDI)[2] (2019)	labor input (% of total population ages 15-64)
Resource blessed	Botswana	***2.45***	7.32	2.04	5.2	*4.76*	1564	0.4531	73.02
	Chile	***3.49***	3.58	1.83	1283.9	*15.46*	2115	0.6949	68.14
	Norway	***1.57***	1.02	1.84	2374.5	*2.58*	3520	0.8117	77.84
	Canada	***1.49***	2.16	1.79	17561.2	*3.91*	7586	0.8285	78.12
Resource cursed	Congo, Rep	***1.63***	16.37	2.17	NA	*47.77*	75	0.2497	70.69
	Ivory coast	***1.12***	37.32	1.93	26	*6.40*	189	0.2185	58.49
	Russia	***2.02***	0.13	1.69	27124.3	*15.22*	15177	0.7215	73.85
	Saudi Arabia	***2.77***	6.14	1.91	357.4	*42.79*	11512	0.6822	57.38
	Venezuela	***1.01***	-2.61	1.68	33	*16.91*	523	0.5128	65.95

Source: Data from WDI and UN e- government survey report. *EGDI range from highest 1 to lowest 0

Table1 summarizes the economic and resource aspects of the economies considered in the study. Countries with a high percentage share of natural resource rent to GDP have lower e-government index and ICT investment expenditure except for Russia and Saudi Arabia. In addition to resources, institutional factors also play a great role in influencing economic growth performance. Hence, the descriptive summary of the institutional aspect is depicted in Table 2 below.

[2] E government development index consists online survey index, telecommunication infrastructure index and human capital index.

Table2: Institutional aspect indicator summary

	Economies	Average property right index(10 highest)	Average economic freedom index (highest 100%)	Strength of legal rights index (0=weak to 12=strong)	Democracy index rank (out of 167 countries) 2019	Corruption index (out of 100, the highest the more clean economy)
Resource blessed	Botswana	6.14	70.18	5	28	*60*
	Chile	6.69	78.18	4	30	*66*
	Norway	8.27	71.71	6	1	*85*
	Canada	*7.99*	79.75	11	7	*82*
Resource curse	Congo, Rep	*2.52*	43.41	6	144	*20*
	Cote d'Ivoire	*3.94*	55.68	6	132	*34*
	Russia	*4.54*	51.07	5	132	*29*
	Saudi Arabia	6.24	62.95	2	160	*46*
	Venezuela	*3.14*	36.58	1	99	*17*

Source: Data from WDI database.

As shown in Table 2 above, the institutional indicators measure reveals a clear difference between the two groups of economies. For example, in terms of property rights index, except Saudi Arabia, all the remaining resource curse countries have a very low level of property right effectiveness. If property right is not strongly protected, investors including foreign direct investment (FDI) are less likely to invest in those economies and as a result, the economy will hardly grow. In terms of corruption index, all the resource curse countries considered in the study are highly corrupt economies although their degrees of corruption are varied. Perhaps, the degree of corruption may depend on the structure of the economy and the market. For instance, countries such as Saudi Arabia, Congo Republic, Venezuela show the highest percentage of natural resources to their GDP and high corruption index with low economic freedom index (high index for corruption means more clean economy, and high index for economic freedom means better private sector than government). It implies that natural resources are converted to corruption because of less economic freedom, weak institution, and rent-seeking behavior of institutions in resource-rich countries and as a result retards their economic growth.

The same is true for democracy index attributes. All the resource curse economies have a lower level of democracy index and economic freedom index. If the economy is not free from the unnecessary

involvement of the government, it discourages the private sectors' economy and as a result, it harms the economic growth of a country. Although it would be good to consider a country's policy and institutional assessment (CPIA) data index as a proxy for institutions, the index capture very diversified social, economic and political aspects and hence difficult to use as a single variable for the proxy of institutional quality in the econometrics estimation. The CPIA index[3] broadly includes the economic management clusters policies, structural policies, policies for social inclusion cluster, governance clusters, and infrastructure and regional integration clusters (WDI, 2019). Therefore, considering the resource curse problem in resource-abundant countries, it is more or less mainly related to resource management, governance, and efficient utilization of the resource. Thus, the study considers the governance cluster indicator particularly the property right and rule-based governance index as a proxy for institutional quality to measure the extent of the impact of institutions on economic growth, for model estimation purposes. Property rights are theoretical socially enforced constructs in economics for determining how a resource or economic good is used and owned. Hence, strong property right is believed to enable and facilitate for efficient resource utilization, extraction, and development, unlike many other countries where the abundant resource is the cause of conflict than the potential of development (Heltberg, R, 2002) [34].

Comparing the annual GDP growth rate for both categories of economies, the relative mean GDP growth varies across each sampled countries as depicted in Figure 4 below.

[3] The CPIA index data is an aggregation (ratings) of many diversified variables and difficult to consider all together as a proxy for a single variable and at the same time no data for those developed countries. So, need to be specific in selecting a proxy for institutional quality and according to the property right and rule-based governance is an appropriate proxy variable according to this study context.

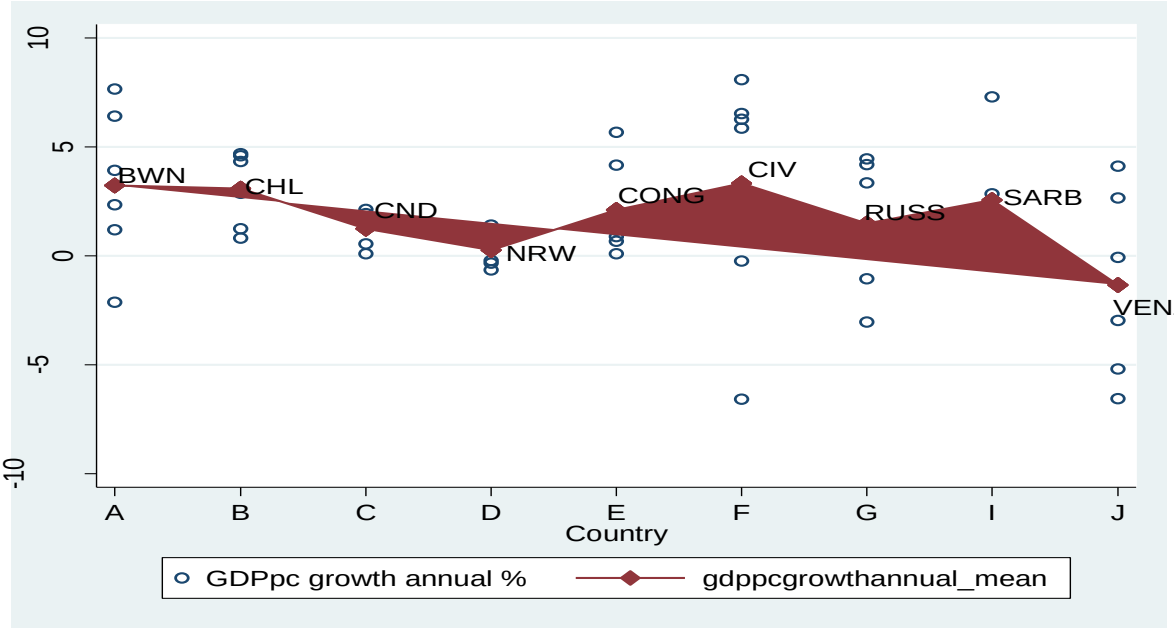


Figure 4: GDP growth rate Heterogeneity across countries

The first four economies from the left that are Botswana, Chile, Canada, and Norway are those successful economies based on the endowed natural resource while the last five economies i.e. Congo Republic, Cote d'Ivoire, Russia, Saudi Arabia, and Venezuela are those which are not successful economies yet. The differences in economic growth depicted in Figure 4 above, are not necessarily happening because of differences in endowed natural resource, rather because of institutional and technological differences. For further empirical analysis, the next econometrics section will investigate the causes of the differences in detail.

4.2. Econometrics Analysis

The study estimates model by categorizing the economies into the resource-rich successful economies, resource-rich curse economies, and pooled economies. By testing the Hausman effect, eventually, the fixed effect panel model is found to be appropriate and it enables to capture of unobservable country's effect. The estimated result of the model is presented in Table 3 below.

Table 3. Economic growth rate estimation result (Fixed effect panel model)

Fixed-effects model: Dependent variable (RGDP growth rate)	Successful economies. Model 1	Unsuccessful economies. Model 2	Pooled economies. Model 3
Log of initial percapita income	.6330 (1.15)	-.3005 (-2.96)***	-.0896 (-1.85)

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Natural resource rent %of GDP	.2465 (3.82)***	-.0965 (-2.16)**	.0045 (1.96)*
Institutional quality	.3121 (3.30)***	-.2005 (-2.86)***	.0554 (2.54)**
ICT infrastructure investment	.0603 (2.25)**	-.7890 (-1.51)	.0562 (3.31)***
Resource *Institution	.0360 (3.80)***	.0191 (2.56)**	.0879 (2.11)**
ICT infrastructure*institution	.0156 (2.36)**	.0015 (2.78)***	.0396 (1.58)
Log of capital Investment (non-ICT)	.0271 (3.00)***	.0817 (1.53)	.0635 (1.25)
Log Labor active input (15-65 years)	.1365 (2.42)**	0.0465 (2.16)**	.0053 (1.98)*
Domestic credit to private sector (% of GDP)	.2560 (2.04)**	-.3640 (-2.16)**	.0864 (1.54)
Log of openness	0. 3537 (1.97)*	-0. 3440 (-4.24)***	-.4761 (-3.57)***
Inflation (GDP deflator)	.0710 (2.16)**	-.0320 (-1.98)*	.0523 (1.59)
Africa	1.8538 (0.64)	1.2998 (5.20)***	.2086 (1.96)*
Latin America	.3720 (0.51)	-.8855 (-4.39)***	.0414 (1.94)
_cons	-1.7446 (-1.32)	7.8648 (4.28)***	.62497 (3.13)***
R-square :within	0.6793	0.7908	0.6601
Between	0.9581	0.8137	0.9498
Overall	0.8186	0.8022	0.8049
Number of obs	100	125	225
Prob > chi2	0.0001	0.0088	0.0065

Notes: The figures in parenthesis are t value. *, **, *** indicate statistical significance at 10, 5 and 1 % respectively. Regional dummies are Africa, Latin America and others. Others are reference dummy.

Table 3 summarizes the results of the estimated model and its interpretation and detail discussion is as follows:

4.3. Discussion and Finding

According to the resource-rich successful economies model (model 1), the contribution of a natural resource to economic growth is significant and positive which confirms the absence of resource curse situation. Besides, the institutional performance and the interaction term of natural resource and

perhaps,
(1) it is better to put also all these numbers into the growth formula to see the regression altogether
(2) define the meaning of these numbers in relation to the respective parameters

institutional performance have positive significant impacts on the economic growth of the successful economies. Furthermore, the initial income level shows a positive but insignificant effect on the real GDP growth rate which is an unexpected result according to the neoclassical convergence theory [32]. The ICT infrastructure investment /services have positive and significant effects on economic growth for the case of successful economies. Other macroeconomic variables considered in this study are such as capital investment, labor input, domestic credit to the private sector, openness, and inflation rate all have positive and significant effects on the economic growth of the successful economies. From the basic neoclassical growth model, the capital and labor input are basic factors of production that lead to economic growth. The domestic credit to the private sector also shows the degree of flexibility of the private sector in the economy and the result reveals that the private sector has a positive contribution to economic growth. Concerning inflation, it is used as a stimulant for producers and production activities and hence encourages a supply-side economy that leads a positive contribution to economic growth.

Concerning the resource-rich but unsuccessful economies case, the effect of natural resource rent on economic growth is negative and significant at 5%, which implies the presence of a resource curse. Moreover, the contribution of institutional quality is negative significant and that of capital investment is positively insignificant on the economic growth of these countries. At the same time, the contribution of natural resource rent as a percentage of GDP on the economic growth of these resource-rich but unsuccessful economies is negative and significant at the 10% level. This shows resources instead of being used as a factor of production and income, it is a cause of conflict, and corruption when institutions are weak. On the other hand, the interaction term between resource and institution shows positive, which implies institutions, help to overcome the problem of resource curse with some minimum thresholds level of quality. Unlike model 1, the initial income level shows a negative significant impact on the economic growth rate, which is expected result according to the neoclassical convergence theory [28]. The trade openness has a significant negative effect on the economic growth of the resource curse countries considered in the study contrary to the case of the successful economies. This may be because of the primary export items with low prices and the huge expense incurred to import high value-added products such as machinery, that devastate their economic performance. Because of weak institutions in these countries no FDI inflows and hence no more economic growth via openness. The impact of ICT service infrastructure is negative but insignificant on the economic growth of resource curse country, but have a positive contribution when interacted with institutions. Variables such as labor active input have a positive and significant effect on economic growth whereas variables such as domestic credit to the private sector and the inflation rate have a negative and significant effect on the economic growth rate of resource-rich unsuccessful economies. Labor active is the source of growth of the economy in many developing countries compared to other factors of production and hence, the result confirms the same.

However, concerning domestic credit to the private sector, the degree of flexibility of the private sector is quite low in these resource-rich but cursed countries due to institutional weakness and lack of good governance. The same logic holds for the effects of inflation as well. The effect of inflation is negative and significant in these resource curse countries and it may be because the weak institutions could not be able to have a strong anti-inflationary policy that converts it into an economic growth opportunity.

Concerning the pooled economies case, (third model), the natural resource rent and institutional performance have a positive significant impact on the economic growth of the pooled economies. That means, all countries together, have no problem with the resource curse, and their institutions are positively contributing to their economic growth. The capital investment has a positive insignificant and trade openness has a negative significant impact on economic growth. The initial income level is negative which shows convergence in per capita income according to neoclassical theory. The ICT service has a positive significant impact on economic growth and its interaction term with the institution has a positive impact on economic growth. Other macroeconomic variables such as labor input have a positive effect on the economic growth of the pooled economies and significant at 10% level whereas variables such as domestic credit to the private sector and the inflation rate have an insignificant effect on economic growth as revealed in Table 3.

Back to the variable of interest in detail, the result obtained for resource-rich successful economies is not in line with those by Mehlum et al (2006) and Boschini et al (2007). The impact of natural resource is significant and positive and that of the interaction term between an institution and natural resources have positive significant. This implies that the natural resource is already properly being utilized and contributing to the economic growth of the country. It confirms that there is no resource curse problem in model 1 and there are no institutional curse problems too.

But in the case of resource-rich unsuccessful economies (model 2), the impact of the natural resource coefficient is negative significant and the interaction term with institutional quality is positively significant and which shows the presence of resource curse can be overcome by combining with strong and capable institutions. The marginal partial impact increases in natural resource abundance on economic growth (keeping other variable constant) of the resource-rich but unsuccessful economies (model 2), is

$$\frac{\partial g}{\partial NR} = -0.0965 + 0.0191 INSTQ$$

According to this partial effect, the institutional threshold for avoiding the resource curse problem is 5.05 out of the 10-point index. For countries with greater than 5.05 institutional quality index, the contribution

of resource abundance on economic growth is higher for resource-rich countries compared to low resource countries and the opposite is true for institutional index less than 5.05 threshold. As a result, countries with higher institutional quality above 5.05 can escape the resource curse problem given other things are constant. Countries such as Congo Republic, Cote d'Ivoire, Russia, and Venezuela have institutional quality index less than 5.05, which implies that these countries have less likely of escaping the resource curse. Thus, assuming other things are constant, these countries need to work hard in building their institutions to manage the resource efficiently and transform it into productive opportunities.

Considering the pooled economies, (Model 3), the natural resource has positive significant and the interaction term of natural resource with institutions have a positive impact on economic performance. This implies that no evidence shows the problem of the resource curse and institutional curse.

The other interesting variable is the role of ICT infrastructure services and its interaction terms with institutional performance on economic growth. The result of model 1 shows that ICT service and its interaction with institutions both have positive and significant effects on economic growth. This result is a bit different in the case of resource curse economies that are ICT service has a negative insignificant effect whereas the interaction of ICT service with Institutions has a positive significant effect on economic growth. The partial effect of a marginal increase in ICT service investment in million dollars on economic growth (assuming other variables are constant) of the resource-rich but unsuccessful economies (model 2), is;

$$\frac{\partial g}{\partial ICT} = -0.7890 + 0.0015 INSTQ$$

According to the partial effect of ICT services investment on economic growth, the ICT service investment threshold level for strengthening institutional capacity and supporting economic growth is 526 million US dollars per year. For instance, countries such as the Congo Republic, Cote d'Ivoire, and Venezuela have an ICT service expenditure less than the estimated threshold level (526 million USD per year). Thus, the higher the ICT service infrastructure and technology penetration and usage, the better the institutional performance that enables to overcome the problem of the resource curse in the resource-rich low-income countries. It is realized that the ICTs facilitate the information distribution, cross-border flow of information, promote international trade, particularly high technology, and help to attract foreign direct investment. In the process of democratization, ICTs can also contribute to political development by fostering good governance and streamlining bureaucratic procedures through intra-governmental networking and by reducing corruption. The creative use of ICTs, particularly the Internet and computer, in the areas of health care, education, environmental protection, and in other developmental and social

sectors can substantially contribute to the advancement of developing societies [35]. Therefore, at the same time, these resource-abundant unsuccessful economies should properly invest on education, digital skills to enable to properly harness the advantage of digital dividends and gradually transform their economies into high tech productive structure than entirely depending on the windfall resources.

The regional dummy variable in models 2 and 3 shows that African economies are more resource curse than other regions. This may tell the extent of the weakness of their institutions compared to other countries and the presence of the problem of good governance. However, this curse can be escaped given those good institutions, and better ICT services are put in place.

Furthermore, as discussed in many of literature, the panel model may suffer from endogeneity problem during estimation. For instance, institutional quality may depend on the economic status and capability of the country, there may be a possible potential endogeneity problem, Dollar and Kraay (2003) [33], because they are rich, they may have good institutions. Many studies have used a different instrumental variable for institutional quality such as Acemoglu, Johnson, and Robinson (2002) [36] used settlers mortality in the ex-colony country as an instrument for institutional quality, Hall and Jones (1999) [37] used distance from the equator (latitude) and several western languages are spoken as instrument for quality of institutions in his studies, Mauro (1995) [38] used ethnolinguistic diversity as an instrument for corruption. This study uses the number of refugees by country of origin, and the interaction term of number of refuges and natural resource as an instrumental variable (IV) for institutional quality. By the same logic, there can also be an endogeneity problem with ICT service infrastructure and adoption. That means the extent of ICT service investment may depend on the economic status and capability of the country and therefore suspect potential endogeneity problem. Thus, the study proposed western language spoken (English or French) as an instrumental variable for ICT service infrastructure investment. It is believed that in the cases of endogeneity problem, instrumental variable, or simultaneous equation model estimation such as two-stages least square (2SLS) and three stages least square (3SLS) are appropriate to estimate the model. Although the 2SLS estimation has a computational edge, the 3SLS is more efficient. The result of the three-stage least square (3SLS) is presented as in Table 4[4] below.

[4] Endogenous variables: rgdp growth rate, Institutional quality index, log ICT capital investment
Exogenous variables: logrgdp0 natural resources rent so fgdp, logt openness, capital investment annual growth, labor input, domestic credit to private sector, inflation GDP deflator, Africa, Latin America, number refuge by country of origin, language spoken, refuge*resource, language*resource

Table4: Three stage least square (3SLS) estimation result.

Dependent variable *1st stage: Real GDP growth rate*	Resource rich successful economies Model 1	Resource rich unsuccessful economies Model 2	Resource rich pooled economies Model 3
Log initial Per capita income	.5039 (1.18)	-.0660 (-2.30)**	-.0916 (-1.95)*
Natural resources % of GDP |	.1622 (2.37)**	-.0377 (-2.31)**	-.0355 (-2.28)**
Log capital Investment/input	.0593 (2.08)**	.01202 (1.95)*	.0423 (2.45)**
Log Labor input	.0823 (2.27)**	.0171 (2.36)**	.0214 (1.98)*
Domestic credit to private	.0782 (1.99)*	-.0412 (-2.75)***	.1875 (1.51)
Log Openness	.0615 (2.27)**	-.2376 (-1.96)*	-.3083 (-1.67)
Inflation (GDP deflator)	.0615 (1.27)	-.2376 (-2.56)**	.3083 (0.52)
Institutional quality	.3673 (3.40)***	-.2445 (-2.75)***	.1454 (2.44)**
ICT services investment	.2605 (2.45)**	-.5646 (-1.56)	.0296 (2.51)**
Institution*resource	.0656 (2.80)***	.0324 (3.46)***	.0789 (2.31)**
Institution*ICT services	.3452 (2.56)**	.0352 (2.88)***	.0476 (1.68)
Africa	-1.809 (-1.29)	1.912 (2.36)**	.4593 (1.95)*
Latin America	-.5176 (-1.34)	-1.298 (-1.95)*	.0942 (0.87)
_cons |	-1.874 (-1.97)*	.0148 (1.02)	.3934 (0.61)
2nd stage: Institutional quality equation			

may want to provide a brief managerial meaning of what these numbers about. For instance, for every 1% increase in refuge, the country's institutional quality drops by 2%

No. refuge by country of origin	-.0208 (-3.53)***	.0754 (3.04)***	-.0247 (-2.05)**
Refuge*resource	.0619 (1.16)	-.0317 (--1.69)	.0270 (1.37)
_cons |	.4455 (4.58)***	1.8312 (6.13)***	3.2403 (5.47)***
3rd stage: ICT service investment/ capital equation			
Language spoken	-.0928 (-0.42)	.3891 (2.10)**	-.3256 (-1.14)
Language* resource	.2310 (1.11)	.3312 (1.51)	.4311 (1.53)
Cons	1.2786 (8.14)***	2.8751 (2.25)**	1.7301 (4.57)***
RGDPgrowth~e "R-sq"	0.7352	0.8903	0.8245
Institutional quality "R-sq"	0.9854	0.8413	0.8796
logICTcapi~investment "R-sq"	0.8938	0.8865	0.7316

* Regional dummies are Africa, Latin America and others. Language spoken is dummy variable denoted 1 if the country official language is English/French, 0=otherwise.

According to the result of 3SLS in Table 4 above, the endogenous variables are real GDP growth rate, institutional quality, and ICT service investment. The endogenous variable institutional quality is instrumented by the number of refugees by country of origin and interaction terms of the number of refugees and resource abundance. For the ICT service investment, the instrumental variables are the language spoken and the interaction of language spoken with resources. It is expected that countries with better ICT service investment and Institutional quality have more likely to obtain higher growth from their resource endowment than countries without good ICT service and institutions. The result of 3SLS shows that better ICT service adoption and usage can mitigate the weakness of institutions on growth, but only economies of good ICT infrastructure can fully overcome the institutional curse. The same is true for institutional quality interaction with resources. That means economies with the better institution can mitigate the negative potential effects of resource abundance on economic growth with some minimum threshold level. Concerning instruments for model 1 and 3, the number of refugees by country of origin is negatively related to the institutional performance, which means that a greater number of refugees for lower institutional quality countries. However, the opposite is true for resource cursed economies. Concerning the western language spoken (English or French) instruments, countries whose official language is either English or French have better ICT service investment that can augment the

performance of their institutions. The regional dummy variable for model 2 shows that Africa is more resource curse economies than other regions.

To ensure the reliability and unbiasedness of the estimated result, the study conducted tests of heteroscedasticity and multicollinearity. Assuming the null hypothesis of homoscedasticity, the result of Modified Wald test for group-wise heteroscedasticity in fixed effect regression model shows that there is heteroscedasticity in the case of model 3 (pooled economies) whereas in the case of successful economies model 1, and unsuccessful economies model 2, the null hypothesis is failed to reject. Concerning the multicollinearity test, the estimated model reveals no strong presence of multicollinearity among the variables.

4.4. Natural resource utilization policies of the successful economies

Countries have their policies to utilize natural resources towards bringing economic development. However, some countries may have a good policy for utilizing endowed natural resources without having good institutions and others may have both good policies and institutions together and vice versa. Hence, to draw a lesson for resource curse economies, the study summarizes the natural resource utilization policy of successful economies as in Table 5 below.

Table 5: Summary of natural resource utilization policy of successful economies

Policies	Canada	Norway	Botswana	Chile
Regulator body and its role	Federal energy board oversea regulation but provincial body collect taxes, incentives, permits and licensing for oil and natural gas	The Norwegian Petroleum Directorate regulates, oil company pay tax rate up to 78 percent, transparent system	Mineral affair division, It divested revenue, and invested surplus revenues from minerals with proper economic diversification policy	Chilean Commission on Copper and the Mining Ministry: publish information, offer licensing[5]
How able to avoid possible Dutch disease problems?	By developing a network of the sector which focuses on creating investment and employment; big industries	Spending on oil revenues has increased gradually to avoid appreciation, higher wages, and prices.	Public investment in infrastructure, human capital. it did not adopt a policy of import substitution	State-Oriented Institutional Approach, Value-Chain Framework
Governance system	Parliamentary democracy	Parliamentary democracy	Parliamentary democracy	Presidential system democracy
Institutions	Strong governing institutions and social capital	producer friendly institutions and rule of law	Good property right, and rule of law	Secured property rights and rule of the game
Population	The diversified origin	Diversified ethnicity	Homogenous	Small diversity with

[5] https://globalriskinsights.com/2014/04/four-countries-that-beat-the-resource-curse/

diversity	with no conflict	with no conflict	population	strong integration
Mineral/resource ownership	Provincial governments with indigenous communities settle issues. Allocating rights to access and use of public lands and natural resources.	The government has retained a 67 percent majority ownership.	A mineral resource is owned by tribal authority	Community foundation with local leadership shareholder state-owned firm, [39]
Other supportive policy	Government invest more on the importance of human capital[42] No resource rent flowing out of community and region, communities receive a share of the earnings	Every year, 4 percent is taken out from resource revenue and used for public services, saved a large share of the petroleum revenues for a future generation [41]	Planning for a future Without minerals[40]	

As summarized in Table 5 above, governance including regulatory body and resource ownership i.e property right aspects of institutions matter a lot relative to others. According to most of the successful economies' experience, the natural resources are partially owned by the local community with local government engagement to able to avoid the possible resource-based conflict. There should be also strong regulatory institutions at the federal or central government integrated with local government so that it can minimize corruption and transform the resources into fully productive sectors. Another good experience from the successful economies is that the governments do not depend on the resources; rather planning the future without the natural resources, save resources for the future generation, and making an investment in human capital, which is the most important in the long run.

5. Conclusion and implication

The study investigates factors for why some resource-rich economies are not successful while others are. Accordingly, the result reveals that the resource-abundant countries have the potential to escape the resource curse given that they have good institutions and better complement with ICT services that enable them to deliver efficient services across institutions. The natural resource abundance and institutional performance indicator have a significant positive impact on the economic growth rate in the case of successful economies whereas negative significance in the case of resource curse economies. This suggests that a resource curse and institutional curse exist in low income with resource-rich countries. However, using the interaction term of institutions and natural resources, the resource curse countries can abate the curse given they built good quality of institutions. Accordingly, the partial effect of the institutional threshold indices level, to avoid the resource curse problem is 5.05 out of 10 highest point indexes. For economies with an institutional quality index above, 5.05, the contribution of resource

abundance on economic growth is higher for resource-rich countries compared to low resource country and the opposite is true for below institutional quality threshold. Hence, countries with higher institutional quality above the threshold level can escape the resource curse problem.

On the other hand, the role of ICT services investment in economic growth had shown a positive contribution to economic growth in the case of successful and pooled economies model, but insignificant in the case of resource curse economies. However, the interaction of the ICT service investment with institutional quality has a positive impact on the economic growth of resource curse economies. According to the partial effect of ICT services, its threshold level for strengthening institutional capacity, to support economic growth is 526 million USD per year on average. Thus, countries with an average investment of ICT services more than 526 million USD per year contributes positively to economic growth via capacitating institutions.

This research study presented an insightful lesson for the governments and policymakers on how they might take advantage of their abundant resources, and ICT service investments to escape from the curse and pursue higher economic growth rates. In particular, the following policy implications are worth considering:

a) Pay attention to building the quality of institutions. This is because economies with higher institutional quality can be capable to manage their abundant resources and convert into productive opportunities. Higher institutional quality comprises of low or no level of corruption, law, and order, and good governance that leads to low rent-seeking activities and efficient property rights. However, Institutional quality may require a huge investment in human capital (capable public servants), rules and regulations, and others as well.

b) Pay attention to information communication technologies and services. This is because countries with better ICT service adoption and diffusion have an efficient way of running public services and private business, low transaction costs that lead to economic growth. Thus, resource cursed countries should invest in information communication technology services such as e-government services to build a strong capable institution which can be able to run the system to be able to escape from the curse. In addition to this, the countries also need to invest in human capital particularly on those with ICT skills to be able to harness the benefit of digital dividends in the Bing bang of digital technology generation.

c) Pay attention to resource ownership rights and governance. This is based on the lesson from the successful economies concerning how they managed their abundant natural resource and convert into productive activities and growth. Thus the resource cursed economies should learn that the natural resources should at least partially owned by the local community with local government engagement to be

able to avoid the possible resource-based conflict and there should be also strong regulatory institutions at federal or central government integrated with local government so that it can minimize corruption and transform the resources into fully productive sectors.

Although the study has good insightful policy implications for resource curse economies, it has a shortfall of a limited number of economies considered in the study. Thus, the study recommends any interested researcher in the future to exhaustively consider many countries as much as possible to get comprehensive results and implications. Additionally, from a methodology perspective, the study used a number of political refugees by country of origin as an instrument for institutional performance, and western language is spoken as an instrument for ICT service adoption and investment. As a result, the study recommends other researchers to come up with other or similar instrumental variables by challenging this argument. The research result and findings depend on the institutional proxy variables used in the study and should be curiously interpreted since it cannot capture the whole institutional aspects.

Declarations of interest: none

References:

old resources/references may have to be accompanied by newer ones, preferably within the last 5-10 years. Because;
1. what was discussed in 1975 about the rise of the Western world was substantially different with the reality in 2020
2. what was discussed in 1998 about sustainable development was drastically different with the reality in 2020
3. and so forth

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