Jurnal Administrare: Jurnal Pemikiran Ilmiah dan Pendidikan Administrasi Perkantoran
Volume 9, Issue 2, July-December 2022, Pages 575-584
Homepage: http://ojs.unm.ac.id/index.php/administrare/index

Measuring The Contribution of Investment, Export, and Internet Usage on Welfare: Indonesian Case Study

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ABSTRACT

This study aims to investigate the influence of investment, exports, and the internet usage on people's welfare, as measured by Regional GDP (RGDP) per capita and the Human Development Index (HDI). The estimation technique employed is Fixed Effect Model with path analysis approach applied to 34 provinces in Indonesia for the period of 2016-2020. The finding suggests that local government spending, exports, and internet use have a positive and significant effect on the RGDP per capita of which act as intervening variable, thus those three variables are indirectly affect HDI. Furthermore, RGDP per capita, local government spending, and investment are simultaneously having positive and significant effect on HDI. However, the impact of FDI is not significant statistically. This is possibly due to the FDI schemes in Indonesia of which constitute as non-project investment, where technology spillover is considered minimum, and capital gains tend to be savored by its beneficial owner in foreign countries.

Keywords: human development index, internet, government spending, fdi, investment, export, regional GDP.

INTRODUCTION

One indicator to measure the success of a country's development is the attainment of population welfare. Traditionally, gross domestic product (GDP) or per capita GDP has been a measure of a country's development (Adeniran, 2018; Newell et al., 2021; van den Bergh, 2022). Nevertheless, this indicator only exhibits one-dimensional measurement, which does not reflect the level of human welfare comprehensively. To gauge the stride of economic development by which more oriented towards human welfare, the United Nations Development Program (UNDP) introduced Human Development Index (HDI) in 1990. HDI is published regularly in the annual Human Development Report (HDR), where such measurement includes three basic dimensions, specifically longevity of life, knowledge, and a decent standard ofliving. Unfortunately, the lower HDI becomes major concern for Indonesia. Even though Indonesia's HDI has increased by an average of 0.76 percent during 2010-2021(Badan Pusat Statistik (BPS), 2021) in nation-wide, but the country was still in position 107 (of 189 countries)with HDI score of 0.718 per 2019 (UNDP, 2020). Subsequently, inter-region HDI disparity reflects the uneven nature of development between regions in Indonesia.Various studies upon factors affecting HDI (e.g., per capita income, government expenditure, transfers of funds from the central government, and local revenue) have been carried out. However, research exploring the effect of investment, internet usage, and exports on HDI in Indonesia is still limited.

We have already acknowledged that the internet has brought various economic benefits and prosperity for the global world, including serving as means for expanding market span, facilitating transactions or trading between distant territories, accelerating the transfer of knowledge and technology, and so on.

Internet users in Indonesia have increased from time to time, from132.7 million in 2016 to 201.37 million in 2021 and are expected to be 239.03million in 2026 (Statista, 2022b). The internet penetration rate in Indonesia has also continuedto increase, amounting 66.19%, 69.8% and 72.87% for 2019, 2020 and 2021, and is expected to be 82.53% in 2026 (Statista, 2022a). The increasing use of the internet is expected to further facilitate the economic activities, which in turn be able to improve economic welfare.

Many studies on economic growth and welfare have found that investment, both in the form of foreign investment and domestic investment, contributes positively on people's welfare (Edeme, 2018; Khasandy et al., 2019; Tridico & Paternesi Meloni, 2018). Therefore, along with the trend of investment realization in Indonesia which tend to increase every year, people's welfare should also rise. In addition to investment, exports may become contributor of economic growth. One notion that promotes the contribution of exports to economic growth is depicted in the Export-Led Growth (ELG) hypothesis, in which according to Heitger in (Medina-Smith, 2001), was first initiated by Kindelberger in 1962. The ELG was departingfrom a background where trade success is considered as the main drivers of the economy in several Asian regions, i.e Hong Kong (China), Taiwan, Singapore, and South Korea (otherwise known as the Four Asian Tigers) which have successfully achieved high economic growth since1960. However, do the trends of increasing exports, investment, and internet usage contribute to people's welfare, especially in Indonesian provinces? Accordingly, the formulation of the research problem is aimed at confirming whether exports, investment, and internet use affect the people's economic welfare as reflected in per capita Regional GDP (RGDP) and HDI in various regions in Indonesia.

With regards to Cobb Douglas Production Function, apart from labor and capital, outputs will also be dependent on efficiency parameter (A), as outlined in the function $Y=AL^{\alpha}K^{\beta}$. In this regards Y denotes output, L is labour, and K represents capital stock. Following Solow (1957) endogenous growth model, any kind of shifts in production function will be embodied as technical change. Such shift can be derived from any various inputs, e.g., educational improvement, knowledge dissemination, human resource capacity. In this matter, FDI, export-oriented companies, and internet serving as the vehicles in knowledge and technology transfer from developed countries (or region) to the developing one which in turns may support economic growth. Whilst government spending, notably those designated for education, health, and infrastructure are viewed as an additional aggregate capital stock which in turn may increase human capital (in form of labour's health and wellness, improved labour's education, and public infrastructure -induced efficiency of the firms).

Pertinent with HDI, why shouldn't the use of "income" be ignored in HDI measurement? Anand & Sen (2000) stated that through life expectancy perspective, per capita Gross National Product (GNP) is correlated with public health care and poverty reduction. But this explanation is not sufficient if we also want to grasp the impact of income in influencing quality of life (apart from increasing life expectancy). The "income" is still required as component to denote the basic resources that humans must achieve other functions even though substantial life expectancy and literacy rate have already achieved. For example, an area may have high achievements in terms of life expectancy and literacy rates, but its residents have exceptionally low-income levels, or do not have reasonably decent housing, or experience a prevalence of malnutrition. In this regard, "income" (which is represented by per capita RGDP) is incorporated as one of the explanatory variables in the HDI function. As such, per capita RGDP is taken into account in the formulation of the model estimation.

One theory discussing the link between government spending and the stages of a country's development is Rostow and Musgrave Theory (Todaro, M. P., dan Smith, 2015). Subsequantly, there are growing literatures which demonstrate that government spending contributes positively on people's development, e.g. Gupta et al.,(1998); Doryan (2001); Rajkumar & Swaroop (2008). In Indonesia, studies on the effect of government spending on HDI have also been carried out. According to Sasana (2012), government spending in general has a positive

and significant effect on HDI. Sari & Supadmi (2016) inferes that capital expenditure has a positive and significant effect on HDI. Furthermore, Setiawan & Fikriah (2020), Diba et al.(2018), Harjunadhi & Rahmawati (2020), Herianingrum et al. (2019), suggest that government spending on health and education simultaneously has a positive and significant effect on HDI.

Many studies have investigated the impact of FDI on the country's economic welfare. Among them namely Sharma & Gani (2004) who found that FDI has a positive impact on HDI in less developed countries and emerging market and developing economies (EMDE), and vice versa in less developed countries, human development has a positive and significant effect on FDI. Generally, FDI also has a positive effect on HDI (Lehnert et al., 2007) and on economic growth of host countries (Liu et al., 2002; Papanek, 1973; Tang et al., 2008), inter alia through transfer of technology (Borensztein et al., 1998; De Mello Jr., 1999). Furthermore, our second proxy for investment is the realization of domestic direct investment (DDI). Based on previous empirical studies, there are findings suggesting that domestic investment has a positive effect on economic growth (Bakari, 2017, 2018; Godwin Emmanuel & Kehinde, 2018; Iya & Aminu, 2015; Sumarsono et al., 2022) and on HDI (Feriyanto, 2016).

In the sphere of exports, there are huge diversity of empirical findings suggests that exports affect economic growth (Asbiantari, 2016; Ekanayake et al., 2003; Olaleye et al., 2013; Siregar et al., 2019). Subsequently, Feder (1983) in his study on some developing countries with semi-industrial characteristics argued that apart from labor and capital aggregate growth, the economic growth can also be induced through resource allocation (from non-export sector that are less efficient, to export sector with high productivity), such that export-oriented sector can generate positive externalities for non-export fields. Feder's findings are also in line with Lee (2011) who posits that economic is inclined to grow rapidly in the countries specializing in the high-tech export vis-à-vis those whose export orientation is traditional with low-level of technology.

One of the propositions that examines the interaction between exports and economic growth is the Export-Led Growth (ELG) theory which holds the view that a country will achieve substantial economic growth if it orients its policies to exports. Since 1980, ELG has even become a consideration for economists, international organizations, and policymakers (Medina-Smith, 2001). Export-oriented policies and trade openness can contribute to a country's economic growth through technological spillover (Ben-David & B. Loewy, 1998), and productivity enhancement (Ahmed, 2011).

The development of information and communication technology as well as increasing internet penetration globally has had an impact on the development of the global economy. Vast amount of news, data, information, and innovations can be accessed easily via the internet, including market demand trends, various goods and services, industrial outlook, financial information, and other form of information. The internet can also facilitate various types of digital transactions to be performed quickly. Diverse of empirical research regarding the role of ICT (using the internet) on economic growth and HDI have also been conducted. By examining several countries in Africa, Ejemeyovwi (2019) found that internet usage has a positive and significant effect on HDI. The use of the internet also has a positive and significant influence on economic growth as measured by GDP, exports, market size, and the United Nations HDI Welfare Index (MacDougald, 2011). Then, J. O. Ejemeyovwi et al. (2019)'s study on 15 members of Economic Community of West African States (ECOWAS) denotes that use of internet, innovation and interaction are positively and significantly correlated with human development.

METHOD

This study employs secondary (panel) data from 34 provinces in Indonesia during 2016-2020, which were obtained from the Central Bureau of Statistics (BPS). We measure the economic welfare using HDI and (RGDP/capita) indicators. Meanwhile, investment is measured by Realization FDI and Realization of DDI. To gauge exports, we utilize the value of non-oil- and-

gas exports based on origin/province. Provincial government expenditure is used to measure regional government spending. The proportion of households accessing the internet within the last 3 month (per province) is adopted as a proxy to capture the internet usage.

The analytical method used in measuring the contribution of government spending, exports, and internet use on the economic welfare in this study is the path analysis method (path analysis). Path analysis is a technique that can be used to analyze cause-and-effect relationships which occur in multiple regression, given that predictor variables affect the outcome variable not only directly, but also indirectly (through intervening variables). RDGP/capita in this circumstance is an intervening variable. Based on the paradigm of the relationship between variables outlined above, the structural consturction of this study is described in the model as follows:

$$LRGDP_{i,t} = \alpha_1 + \beta_1 \text{LGSPEND}_{i,t} + \beta_2 \text{INTERNET}_{i,t} + \beta_3 \text{LEXPORT}_{i,t} + e_{1i,t} \quad \ldots. (1)$$

$$HDI_{i,t} = \alpha_2 + \beta_4 \text{LRGDP}_{i,t} + \beta_5 \text{LGSPEND}_{i,t} + \beta_6 \text{LFDI}_{i,t} + \beta_7 \text{LDDI}_{i,t} + \beta_8 \text{LEXPORT}_{i,t} + e_{2i,t} \quad \ldots. (2)$$

Where:

HDI	= Human Development Index (province)
LRGDP	= Ln provincial RGDP/capita on current price (IDR million)
A	= constant
B	= regression coefficient
LGSPEND	= Ln government expenditure /province (IDR trillion)
INTERNET	= proportion of households accessing the internet in the last 3 months/ province
LFDI	= Ln Foreign Direct Investment realization (USD million)
LDDI	= Ln Domestic Direct Investment realization (IDR trillion)
LEXPORT	= Ln the value of non-oil-and-gas exports by province of origin of the goods (USD million)
e	= error term
i	= Province
t	= Year

While the path analysis chart can be described as follows:

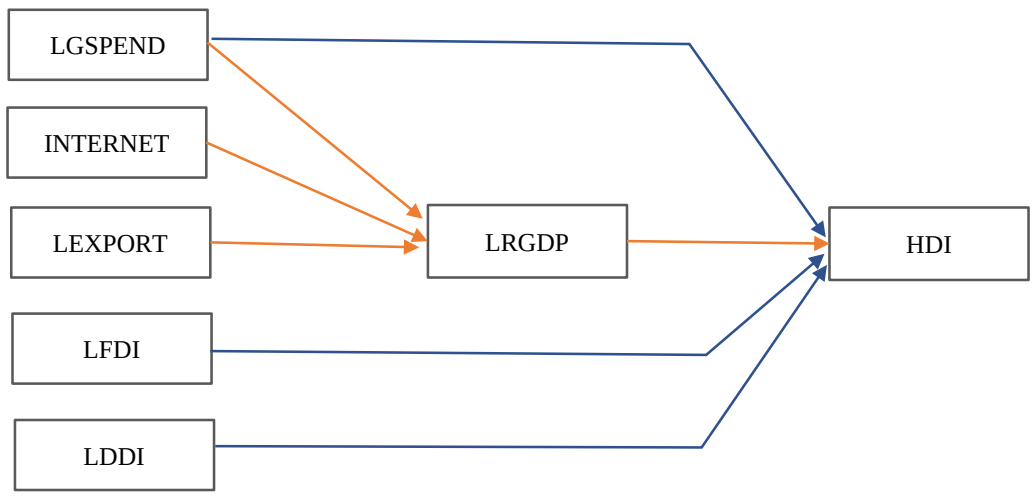


Figure 1. Path Analysis Diagram

RESULT AND DISCUSSION

Analytical Method

We perform a series of analytical procedures to select the best estimation method among the three models in panel data testing, namely the Common-Effect Model (CEM), Fixed-Effect Model (FEM), and Rendom-Effect Model (REM). For such purpose, the models will be tested using the Chow Test and Hausman Test. The Chow-Test aims in stipulating whetherCEM or FEM is more appropriate to be applied in the regression analysis. If the probability value F <0.05, then FEM would be more suitable to be employed as the estimation method. Chow test results are disclosed in the following tables:

Table 1.
Chow Test Output for Model 1

Effects Test	Statistic	d.f.	p-value
Cross-section F	394.310418	(33,133)	0.0000
Cross-section Chi-square	780.889246	33	0.0000

Table 2.
Chow Test Output for Model 2

Effects Test	Statistic	d.f.	p-value
Cross-section F	306.563740	(33,132)	0.0000
Cross-section Chi-square	739.856116	33	0.0000

Based on the Chow Test result, a probability value was less than 0.05. Thus, it can be concluded that FEM is preferable to CEM. After conducting the Chow-Test, we then tested the model using the Hausman-Test. This is done to find out whether FEM or REM is more suitable to use in model estimation. If the probability value F > 0.05, then the model will be estimated using REM. Hausman test results are shown in the following tables:

Table 3.
Hausman Test for Model 1

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	p-value
Cross-section random	16.153344	3	0.0011

Table 4. Hausman Test for Model 2

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	p-value
Cross-section random	20.914803	4	0.0003

It is noticed that based on the results of the Hausman Test, the probability values are less than 0.05. For that matter, FEM is considered more suitable to use than REM for both models. Based on the result of Chow Test and Hausman Test, it can be concluded that FEM is most appropriate to be used in estimating the models, so it is no longer necessary to carry outthe Lagrange Multiplier Test to select between REM and CEM.

Classical Linear Regression Models Assumption Test

Classical linear regression assumption test is done to ensure that the model estimation can be said as BLUE (Best linear unbiased estimators). A multicollinearity test is conducted to ascertain that the models do not encounter multicollinearity problems. Thereafter, a heteroscedasticity test is done to confirm that there is no heteroscedasticity issue. At the onset, we encountered heteroscedasticity problem. Fortunately, it has been overcome by utilizing a robust standard error (Huber-White). Meanwhile, since the FEM method applies the OLS, instead of GLS approach, the normality test is not mandatory.

– **Multicollinearity Test**

To detect whether there is a perfect relationship between the independent variables, an examination is made upon correlation values between the independent variables.

Table 5.
Multicolinearity Test for Model 1

	LGSPEND	INTERNET	LEXPORT
LGSPEND	1.000000	0.082351	0.574539
INTERNET	0.082351	1.000000	0.323286
LEXPORT	0.574539	0.323286	1.000000

Table 6.
Multicolinearity Test for Model 2

	LRGDP	LGSPEND	LFDI	LDDI
LRGDP	1.000000	0.131902	0.388298	0.312061
LGSPEND	0.131902	1.000000	0.693803	0.573379
LFDI	0.388298	0.693803	1.000000	0.582085
LDDI	0.312061	0.573379	0.582085	1.000000

As shown from the two tables above, the correlation coefficient value of each independent variable is below 0.9, so it can be concluded that there is no deviation from the multicollinearity assumption.

– **Heteroscedasticity Test**

The results of the Heteroscedasticity test show that in both models, Probability > Chi2 is less than 0.05 so it can be concluded that the data was experiencing heteroscedasticity problem. To overcome this issue, estimation is done using the Huber-White robust standard error (SE).

Results and Discussion

The FEM estimation output using robust SE for both models are shown in two tables as follows:

Table 7.
FEM Estimation Output for Model 1

	Dependent variabel: LRGDP			
Variable	Coefficient	Robust Std. Error	t-Statistic	p-value
C	2.534931	0.3674742	6.90	0.000
LGSPEND	0.240219	0.1156203	2.08	0.046
LEXPORT	0.038203	0.0131761	2.90	0.007
INTERNET	0.507413	0.0710067	7.15	0.000
R-squared	0.7614			
F-statistic	66.62			
Prob(F-statistic)	0.0000			

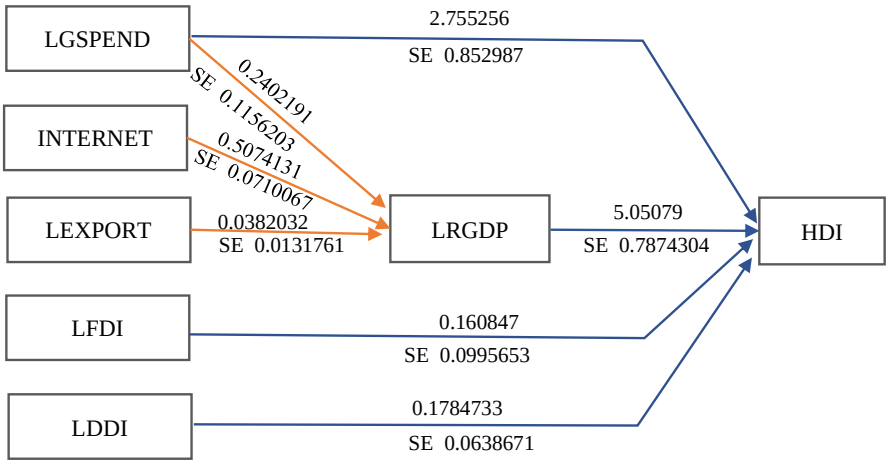
From the estimation output above, it can be known that based on R squared, explanatory variables in model (1) are able to simultaneously explain the per capita RGDPby 76.14%. Furthermore, the probability of the F-statistic which is smaller than 5% means that these variables simultaneously affect the LRGDP variables significantly. In this regard, H1 for equation (1) is accepted, which denotes that there is a significant influence between the variables of exports, internet usage, local government spending on RGDP per capita. Each explanatory variable is significant per se based on t-statistic.

Table 8.
FEM Estimation Output for Model 2

Dependent variabel: HDI				
Variable	Coefficient	Robust Std. Error	t-Statistic	p-value
C	39.33717	2.237021	17.58	0.000
LRGDP	5.05079	0.7874304	6.41	0.000
LGSPEND	2.755256	0.852987	3.23	0.003
LFDI	0.160847	0.0995653	1.62	0.116
LDDI	0.1784733	0.0638671	2.79	0.009
R-squared	0.7795			
F-statistic	67.21			
Prob(F-statistic)	0.0000			

From the estimation output above, it notable based on the R squared value that the explanatory variables in model (2) can simultaneously explain the RGDP/ capita by 77.95%. Furthermore, the probability (F-statistic) which is less than 5% signifies that the explanatory variables simultaneously affect the LRGDP significantly. Therefore, in this case H1 for equation (2) is accepted, implying that there is a significant influence between RGDP per capita, local government spending, FDI, and DDI concurrently on HDI. From theprobability value of the t-statistic, it can be interpreted that FDI has no significant effect, while other explanatory variables are significant.

Figure 2. Depiction of the Regression Output on the Path Analysis Diagram



Afterwards, we performed Sobel Test to inquire how strong the role of the intervening variable (LRGDP) in mediating between the INTERNET, LGSPEND, LEXPORT, and LFDI variables with HDI. The Sobel test is carried out using the following formula:

$$|z| = \frac{ab}{\sqrt{(b^2SE_a^2) + (a^2SE_b^2)}}$$

Where:

a = Regression coefficient of explanatory variables's impact on intervening variable
b = Regression coefficient of intervening variable's impact on explained variable
SEa = SE of estimation of explanatory variables's impact on intervening variable
SEb = SE of estimation of intervening variable's impact on explained variable

The FEM estimation output using robust SE for both models are shown in two tables as follows:

Table 9.
Sobel Test Result

Variabel bebas	koefisien a	koefisien b	SE a	SE b	z
LGSPEND	0.2402191	5.050791	0.1156203	0.7874304	1.976552268
INTERNET	0.5074131	5.050791	0.0710067	0.7874304	4.773371413
LEXPORT	0.0382032	5.050791	0.0131761	0.7874304	2.642044816

Based on the above table, it salient that all z values > 1.96 (with a significant level of 5%), thus this proves that LRGDP can significantly mediate the relationship between LGSPEND, INTERNET, EXPORT with HDI. Path Analysis as depicted in model (1), model (2), Figure 1 and Figure 2 is constructed by considering the initial estimation results establishing that LFDI and LDDI are not significant enough to LRGDP when tested simultaneously with the INTERNET and LEXPORT variables. Thus, model (1) is estimated using the LGSPEND, INTERNET, and EXPORT variables only.

Through path analysis, the direct and indirect influence of the explanatoryvariables on HDI can be calculated as follows:

Table 10.
Direct and Indirect Effect of Independent Variables on HDI

Variable	Direct Effect	Indirect Effect	Total Effect
LRGDP	5.050791		5.050791
LGSPEND	2.755256	0.240219	2.995475
LFDI	0.160847		0.160847
LDDI	0.178473		0.178473
LEXPORT		0.0382032	0.0382032
INTERNET		0.5074131	0.5074131

The influence of the predictors on people's welfare which in this case is proxied by per capita RGDP and HDI can be explained first, local government spending, exports, and internet usage simultaneously have a positive and significant effect on per capita RGDP. These three variables also hold indirect effect on HDI through per capita RGDP. An addition of 1% in government spending, exports and the proportion of internet users will increase per capita RGDP by 0.24%, 0.038% and 0.66%, respectively. This result is consistent with many previous studies implying that internet usage can increase economic growth and human development, among others by increasing RGDP ((MacDougald, 2011) and increasing innovation (Ejemeyovwi et al., 2019). Secondly, RGDP per capita, local government spending, FDI, and DDI simultaneously have a positive and significant contribution on HDI. An increase of 1% in RGDP per capita, government spending, FDI, and DDI can increase HDI by 5.1%, 3%, 0.16% and 0.17%, respectively. This is in line with (Anand & Sen, 2000) finding implying that per capita income will enhance human development. However, based on the t-test, the positive impact of FDI on HDI is statistically not significant. This is consistent with (Kim & Seo, 2003) research.

The initial probable cause is the composition of FDI in Indonesia. The proportion of non-project investment scheme in each of province during 2016-2020 was greater than project scheme. During 2010-2021, the non-project FDI worth USD 325.15 billion while project-scheme FDI amount USD 236.13 billion. The non-project investment scheme is viewed to bring less benefits in terms of welfare compared to projcet scheme because diffusion or transfer of technology to the host region is not optimal, that the technical change does not or occur as expected. Moreover, large portion of capital gains tend to only be enjoyed by shareholder abroad. Further possible cause is a negative externality in the form of environmentaldegradation and social problems in consequeces of the presence of foreign companies, either directly or indirectly, e.g., forest damage due to logging, air pollution (carbon emissions),environmental pollution due to factory waste, the

emergence of slums areas in outer cities or industrial areas due to urbanization. Such negative externalities require costs to compensate for the negative impacts that it may reduce or offset the positive impacts of FDI. These matters can be subjects that can be further explored.

The implication of this paper is that government needs to effectively effectively allocate their government spending, especially to facilitate the infrastructure supporting internet connectivity and education, including for those living in remote and underdeveloped area. Moreover, it is pivotal that government should prioritize project based FDIs, on the ground that the technology diffusion is expected to be occurred more under this FDI scheme. Of course, it demands the government to accelerate the effort in improving its citizen educational attainment and quality. This is chiefly to narrow the technology gap, so that the technology difussion may take place through FDI.

CONCLUSION

The research findings shed light that government spending, exports, and internet usage are simultaneously affect RGDP/ capita. All three also affect HDI indirectly through the intervening variable, which is GRDP/ capita. Subsequently, local government spending, RGDP per capita, foreign direct investment (FDI), and domestic direct investment (DDI) concurrently have a positive and significant influence on HDI. However, the effect of FDI per se is not significant statistically. This is possibly induced by the scheme of FDI in the Indonesianprovinces, where major proportion of the FDI was non-project in nature, during the covered period. It is considered that non-project investment scheme tends to has less impact on host region's economic welfare due to several reasons. First, it has minimum knowledge spillover or technology transfer compared to project investment scheme. Secondly, large proportion of capital gain will normally be funeled and savored by its shareholder abroad.

Further research is entailed to explore on how income inequality and household consumption pattern affect HDI or the vice versa. Future study regarding FDI to account for spatial and industrial group is also necessary, to better capture the nature of FDI in affecting economic growth. Research to explore the bidirectional interplay between FDI, export, internet, and growth is also enticing subject.

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