



Digital Economy and Gender Well-Being Measurement: Evidence from Indonesia

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1. Introduction

Information society era can be seen through the rapid growth of Information and Communication Technology (ICT), but there are still gaps among countries and within countries which is known as digital divide. The Internet Society and TRPC (2015) mention that the digital divide within nations is between the 'haves' and the 'have-nots' in terms of internet connectivity and affordable usage, while the digital divide between nations is about bandwidth (capacity) and transmission speeds (usage). Digital divide has been a problem of the world today especially among ASEAN countries. Across ASEAN countries internet penetration varies from as much as 73% of the population in Singapore to little more than 1% in Myanmar (The Internet Society and TRPC, 2015). Based on World Bank Indicators 2014, Indonesia categorized in the third cluster as low internet access. It was different compare to Singapore, Malaysia, and Brunei Darussalam which were in the first cluster as majority access, while Thailand, Philippines, and Vietnam in the second cluster as partial access.

Digital divide is also as a gender problem. Digital divide as a problem of women including access to the internet and others lack of access to ICTs, and also digital divide in terms of advanced ICT skills. ITU (2013) estimated that some 200 million fewer women are online, compared with men. In 2003, Commission on the Status of Women had directly

focused on the issue of ICT and the empowerment of women. The commission adopted agreed conclusions which addressed women's equal access to ICT-based economic activities and employment (United Nations, 2005).

Economic development can be achieved by enhancing some social economic indicators such as human development and ICT. ICT can accelerate the development of economics which in turn impact to social economic life. ICT Development Index as a measure of the development of Information and Communication Technology (ICT) so that it needs more understanding and concern. ICT Development Index is very sensitive index. It is because it depends on data source, definition and method in collecting data, ideal value, and area, national or sub-national level. ICT Development Index is a composite index so that the figures depend on each component index and the weight of each component. Sub-directorate of Communication and Information Technology Statistics, Statistics Indonesia, have been trying to develop ICT Development Index in sub-national level in Indonesia.

ICT development index as a composite index which combine eleven indicators into one benchmark measure, consists of three sub-index. The three sub-index of ICT development index are ICT access and infrastructure, ICT use, and ICT skill. Based on the International Telecommunication Union (ITU) data, sub-index use has the smallest contribution to ICT development index in term of average value in 2015. By improving internet access, digital divide can be reduced.

Factors affecting economic development can be classified into two, they are economic factors and non-economic factors. Investment in human capital could have a more permanent impact on the growth process if high skills and training go hand-in-hand with more intensive research and development and a faster rate of technological progress, or if the adoption of new technologies is facilitated by a highly skilled workforce (Bassanini and Scarpetta, 2001). Robert J. Barro (1996) found that the growth rate is enhanced by higher initial schooling and

life expectancy, lower fertility, lower government consumption, better maintenance of the rule of law, lower inflation, and improvements in the terms of trade.

The Solow growth model is designed to show how growth in the capital stock, growth in the labor force, and advances in technology interact in an economy as well as how they affect a nation's total output of goods and services (Mankiw, 2009). According to the Solow model, technological progress can lead to sustained growth in output per worker where it is persistently rising living standards. Neo-classical growth theory, based on the expanded Solow model, suggests that long run growth is dependent upon labor force growth and technological progress (Grossman and Helpman, 1994). This study enhance the literature of Solow growth model and Neo-classical growth theory by using internet penetration as technological progress.

By providing access to information, connecting people to business everywhere, and opening up new markets, the internet can transform the very nature of an economy and support economic development (Deloitte, 2014). Internet enhanced speed and quality of information flows result in reduced transaction costs, internet enhanced access to financial capital with services such as mobile banking, internet access enhances the productivity of labour and capital, internet improved human resource qualification and specialization, internet can be facilitation of entrepreneurship and business expansion so it opens the access to new markets, and there will be greater innovation and adoption of new organizational models and business processes (Deloitte, 2014).

There are a number of factors that make it difficult for people to obtain access to the internet such as poverty; high device, data, and telecommunications charges; infrastructure barriers; digital literacy challenges; and policy and operational barriers (West, 2015). In addition, West (2015) mentioned that lacking disposable financial resources makes it difficult to purchase devices or gain access to digital services.

According to Ernst & Young, over the next decade, the impact of women on the global economy – as producers, entrepreneurs, employees and consumers – will be at least as significant as that of China’s or India’s one –billion-plus populations, if not greater (UNESCO, UN Women, ITU, and Microsoft, 2013). Ann Mei Chang in ITU and UNESCO (2013) stated that access for women is often correlated with the development of a country, implying that the gender gap will fall away as an economy matures. Furthermore, World Bank (ITU and UNESCO, 2013) has estimated that a 10% increase in broadband adoption will result in a 1.38% increase in economic growth which is also intuitively obvious, as access to the Internet can enable women to increase their productivity, access new markets, improve their education, find better jobs, and contribute to the innovation economy. In sum, the main question of this study are whether women and men internet access can influence economic development or not in Indonesia, and this study also try to investigate the relationship between socioeconomic variables and digital divide in Indonesia in 2015. The first part of this paper about the difference in internet access of women and men that indicate the digital divide in Indonesia. The second part of this paper analyse the digital divide in Indonesia in 2015 based on the relationship between digital divide and socioeconomic variables. This study use percentage of poor people, Human Development Index (HDI), skill sub-index, unemployment rate, and Gross Regional Domestic Product (GRDP) per capita as proxy of other social indicators.

2. Data and Methodology

The analysis include all provinces in Indonesia in 2015. Internet penetration data was calculated from National Socio Economic Survey (Susenas). Meanwhile, ICT Development Index and its sub-index, percentage of poor people, Human Development Index (HDI), and Gross Regional Domestic Product (GRDP) per capita were taken from Statistics Indonesia

website. In order to investigate the influence of internet penetration on economic development, we obtained linear regression model.

This study also uses the canonical correlation to analyse the relationship between socioeconomic variables and digital divide. Canonical correlation is a method that enables the assessment of the relationship between two sets of multiple variables (Hair, et.al., 2010). In applying canonical analysis, it is helpful to think of one set of variables as independent and the other set as dependent, however, it does not imply that they share a causal relationship (Hair, et.al., 2010).

3. Internet Access in Indonesia

In 2015, the percentage of Internet users in Indonesia amounted to 21.98 persen. Among 34 provinces, DKI Jakarta as the capital city of Indonesia has the highest percentage of internet user, 46.63 %. The infrastructure and facilities of the internet are well provided in this city. While the lowest percentage of internet users was in Papua, 8.98%. Papua is located in the eastern part of Indonesia. The development of the infrastructure, the skill of the people, and other socioeconomic aspects in Papua are left from the other provinces.

The internet access by gender is believed as one of the factor that influence the socioeconomic condition in a province. Gini ratio describes the income inequality in a province. The plot between internet access by gender and gini ratio of 34 provinces is shown in the plot. The plot does not show a high relationship between gini ratio and internet access by female. DKI Jakarta has the highest internet access by female and also quite high gini ratio. It means that DKI Jakarta still has high income inequality although many of the female in this city accessing the internet. While Maluku Utara has the lowest internet access by female and the lowest gini ratio. It means that the income in Maluku Utara is relatively equal

when there are less female accessing the internet. Kep. Bangka Belitung has a low gini ratio and slowest speed in the increasing of internet access percentage.

The same pattern is shown in the plot between internet access by male and gini ratio. The plot does not show a high relationship between gini ratio and internet access (male). DKI Jakarta has the highest internet access (male) and gini ratio, and the lowest both in internet access (male) and gini ratio was Maluku Utara. Kep. Bangka Belitung has a low gini ratio and slowest speed in the increasing of internet access percentage.

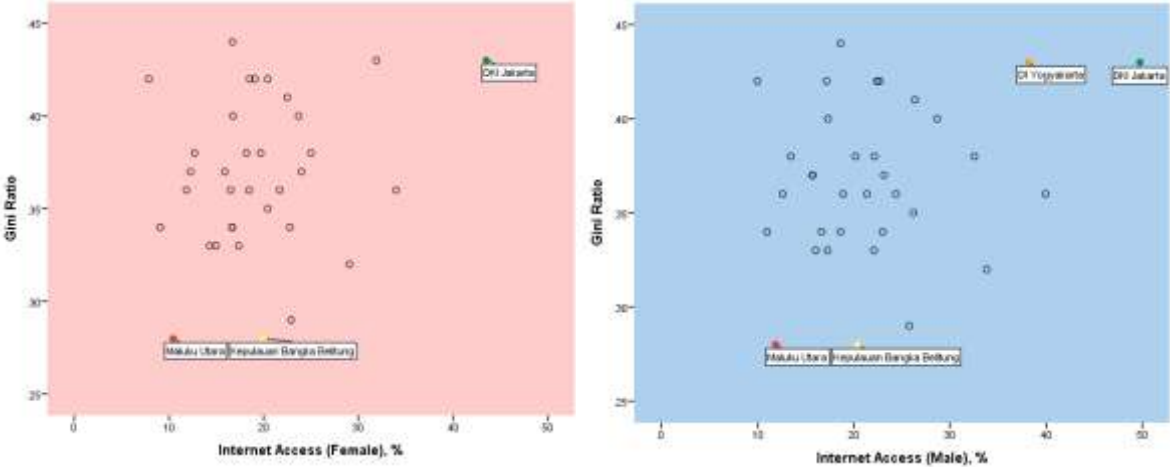


Figure 1. Plot of Gini Ratio and Internet Access (Female and Male), 2015
 Source: Author’s Calculation, BPS-Statistics Indonesia

Besides gini ratio, GRDP percapita can also show the socio economic condition in a province. The plot shows a positive relationship between GRDP per capita and internet access (female). DKI Jakarta has the highest internet access (female) and GRDP per capita. Kalimantan Timur is the second province with high GRDP and the internet access by female also quite high. Nusa Tenggara Timur has the lowest internet access (female) and GRDP per capita. While Papua has a quite high GRDP per capita, but very low in internet access (female).

The plot between GRDP per capita and internet access (male) also shows a positive relationship. The pattern is similar with the plot of female, that is DKI Jakarta has the highest internet access (male) and GRDP per capita. Nusa Tenggara Timur has the lowest internet access (male) and

GRDP per capita. As for Papua has a quite high GRDP per capita, but very low in internet access (male).

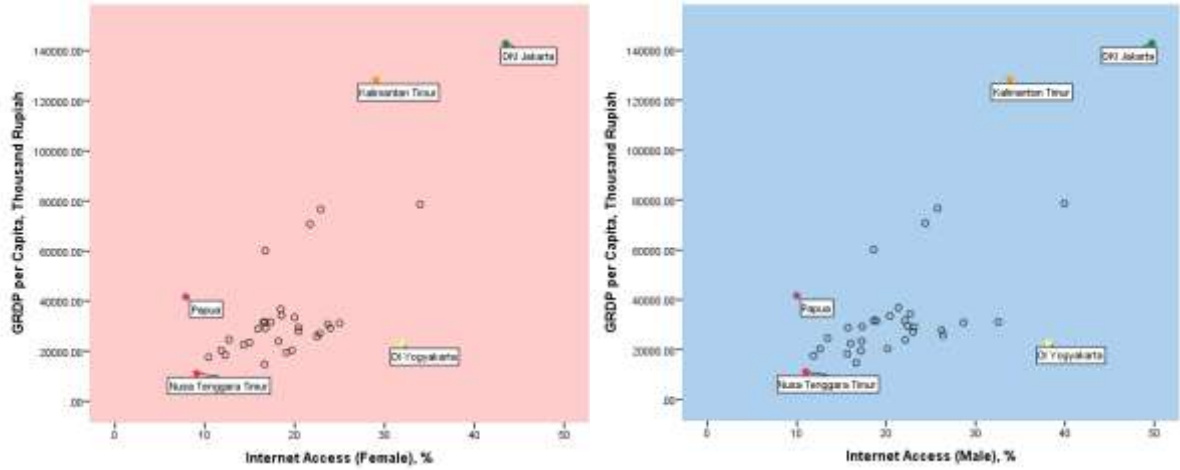


Figure 2. Plot of GRDP per Capita and Internet Access (Female and Male), 2015
 Source: Author’s Calculation, BPS-Statistics Indonesia

Based on regression analysis, in 95% confidence level, 42.5% variation of GRDP per capita can be explained by internet access (female). Internet access by female influence GRDP per capita significantly, if internet access by female increase 10%, GRDP per capita will increase by 0.51%. the result is a bit different with male that in 95% confidence level, 42.8% variation of GRDP per capita can be explained by internet access (male). Internet access by male influence GRDP per capita significantly, if internet access by male increase 10%, GRDP per capita will increase by 0.43%. Ann Mei Chang in ITU and UNESCO (2013) stated that access for women is often correlated with the development of a country, implying that the gender gap will fall away as an economy matures. Furthermore, World Bank (ITU and UNESCO, 2013) has estimated that a 10% increase in broadband adoption will result in a 1.38% increase in economic growth which is also intuitively obvious, as access to the Internet can enable women to increase their productivity, access new markets, improve their education, find better jobs, and contribute to the innovation economy.

$$\ln(\widehat{GRDPpC}_i) = 9.366 + 0.051 * \text{Internet access (female)}_i$$

$$R^2 = 0.425$$

$$\ln(\widehat{GRDPpC}_i) = 9.419 + 0.043 * \text{Internet access (male)}_i$$

$$R^2 = 0.428$$

4. The Development of ICT in Indonesia

The development of ICT in Indonesia can be figured by ICT Development Index as an composite index which combine three sub-index. Three sub-index of ICT Development Index are access and infrastructure, use, and skill. ICT Development Index of Indonesia were increase year by year during 2012 to 2015, in 2012 ICT Development Index of Indonesia was 4.24, increase to 4.5 in 2013, 4.59 in 2014, and 4.83 in 2015. In line with the index, its sub-index were also increase year by year during 2012-2015.

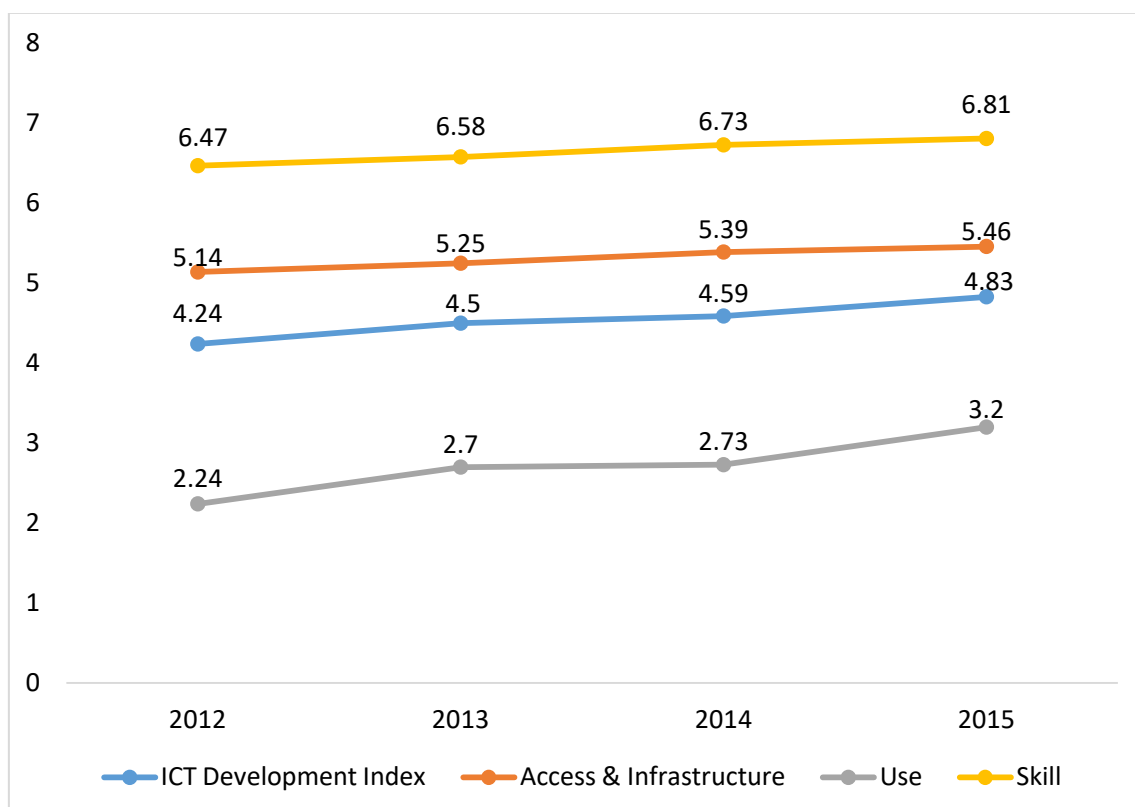


Figure 3. ICT Development Index of Indonesia and Its Sub-Index, 2012-2015
Source: BPS-Statistics Indonesia

In order to investigate the relationship between group of variables X (socioeconomic variables) and group of variables Y (ICT development) in 2015, the canonical correlation analysis was obtained. In this case, group of variables X (socioeconomic variables) consist of skill sub-index of ICT Development Index, health (percentage of population having health complaint during the last month), unemployment rate, percentage of poor people, and Gross Regional Domestic Products (GRDP) per Capita. In overall, Omnibus test shows that all variables used were statistically significant. Meanwhile, group of variable Y (ICT development) consist of access and infrastructure sub-index and use sub-index of ICT Development Index.

According to the canonical correlation analysis, the canonical correlations for the first function was statistically significant. This first function has result with a canonical correlation of 0.89474 (Wilks lambda = 0.16625 ; F = 7.84363; df = 10 ; p = 0.000). The canonical correlations for the second function was not statistically significant. The second canonical correlation function produce a canonical correlation of 0.40788 (Wilks lambda = 0.83363 ; F = 1.39698; df = 4 ; p = 0.261). The highest correlation was between digital divide and GRDP per capita (0.826).

Variance explained by canonical variables of dependent variables (socioeconomic variables) tell us 25.58 percent of variance between dependent variables accounted for by the dependent canonical variate, and a 20.48 percent of variance between the dependent variables is accounted for by the covariate canonical variate. In addition, variance explained by the canonical variables of the covariates (ICT development) tell us 77.09 percent of variance among the covariates accounted for by the dependent canonical variate, and a 96.296 percent variance among the covariates is accounted for by the covariate canonical variate.

5. Conclusions

Internet access by female influence GRDP per capita significantly. As well as the model of female internet access, internet access by male also influence GRDP per capita significantly. The regression model of female shows that if female internet access increase it will lead to the increasing of economic development, this result was better than the model of male. Moreover, the result of the canonical

correlation indicate a statistically significant relationship between socioeconomic variables and digital divide. The effect of GRDP per capita was more than the effects of other socioeconomic variables on digital divide. This study has indicated that socioeconomic variables are correlated with the reduction of digital divide in Indonesia. These all findings are very useful to support policy formulation and intervention program for Indonesia especially on gender development. Those have shown that policies intervention started from planning, implementing, and monitoring-evaluation of development program should be included digital matters in the gender mainstreaming program in order to boost women empowerment in economy. This evidence of Indonesia experience can be a lesson learnt source of other developing countries in terms of measuring the effect of digital economy to gender development.

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