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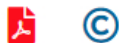
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
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Feedback

The Relation between Internet Use and Societal Development in Indonesia

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Abstract—We seek to explore the plausible relation between internet use on one hand, and human development index (HDI) and crime incidence on the other in Indonesia. By using numbers reported in Statistical Yearbook Indonesia 2018 by BPS, the regression model reveals that internet is positively related to the increment of HDI level. However, internet use is also positively related to the number of crime incidence; meaning more crimes with internet use. The year 2017 seems to be an interesting year to investigate more deeply, as it is negatively related to both HDI level and number of crime incidence. These results are robust to unemployment rate and labor participation conditions during 2015 thru 2017. These findings reveal differentiated relations between internet use and current societal development in Indonesia.

Keywords—internet, human development index, crime, Indonesia.

I. INTRODUCTION

This paper uses recent published national statistics report by Statistics Indonesia (*Badan Pusat Statistik*: BPS) to explore the relation between internet use and development in our present-day society. A body of literature shows that the rise of internet use can improve, although not radically, society's economy, education, health and even quality of life [1]. These studies particularly suggest that a greater access to the internet would improve the way information is spread in developing countries, especially in rural areas, and hence promote positive changes to the socio-economic development. A clear example obtained from the e-health program between developed countries (e.g. Australia) and the war-torn countries (e.g. Iraq and Afghanistan). In this program, health professionals exchange information and even practical skills through emails and digital cameras connected to the internet [2].

A competing body of literature, however, echoes a rather negative tone of the internet impact. For instance, Hui proclaimed that internet has paved a way for people to get to know radical religious stances along with their religious organizations as well as their daunting agendas [3]. Her study in Indonesia has shown that some Indonesian hard-line websites even provide bomb manuals (password-protected websites). Internet also allows people with similar stances to easily get connected using the available online-platforms. A real example taken from interreligious conflicts in Ambon

shows that false rumors from unknown parties often spread via text messages and internet [4]. Further, internet has expanded opportunities for various crimes to be performed both online (e.g. cyber-fraud) and offline (e.g. illicit drugs trade, prostitution) [5], [6].

Given the embeddedness of internet in our modern social structures of finance, health, education and economy, this study attempts to explore the contradictory relation between internet use and key indicators of societal development. To this end, we employ the two worldwide used measures that directly relate to the country's societal development; human development index (HDI) and crime incidence. The use of HDI and crime incidence measures is twofold. One, on the basis of internet expansion to various life activities, these two measures capture the societal impacts of internet in any given society. Two, employing these two measures methodologically cover social well-being measures of health expectancy and duration school expectancy, and economic measures of expense per capita and its relevance to societal safety.

In particular, this study uses numbers published in a recent report of Statistical Yearbook of Indonesia 2018. Briefly, the annual report publishes previous years findings on key socio-demographic and economic characteristics of the nation based on national census, and summarizes them, mostly, at the provincial level [7]. For the purpose of this study, we are specifically interested in looking at the percentage of internet use, unemployment rate, HDI and crime incidence at the provincial level. Due to some unbalanced findings in 2014, we only include data from 2015 to 2017. While previous studies mainly focused on the disparity between regions and countries in terms of internet impacts, our main contribution is to investigate the relation of internet use with major societal development measures. Taken together, we aim to answer to *what extent is the growth of internet use related to HDI and crime incidence provincially in Indonesia?*

II. CONCEPTUAL FRAMEWORK

Here, we briefly provide theoretical notions of all the variables employed in the study. At the end of each theoretical explanation, we present our theoretical expectation and a corresponding hypothesis (if applicable).

A. Internet in Indonesia

The first introduction of internet in Indonesia was in 1983, when Joseph Luhukay established an internet connection in the Department of Computer Science, University of Indonesia (UI), and linked to the UUNet in the United States [8]. However, the commercial establishment was not until 1994 when PT Indo Internet (Indonet) was born as the first commercial internet service providers (ISP) in the country. Although the connection was still considered slow, the business gradually went booming marked by the presence of more than 20 other ISPs operating in 1996. The year is indeed a watershed moment in internet accessibility to Indonesians. The new competition of ISPs was soon followed by the emergence of internet cafes (*warung internet: warnet*). Fast forward two decades, Indonesia is now one of the countries with the highest number of internet users in the world [9].

Internet use and its impact. Here, we should note that the word impact does not necessarily connote with causality. Consisting of 17,000 islands along the equator line, Indonesia is an interesting case in terms of internet use. With its staggering number of internet users, 143.3 million, Indonesia's penetration rate is only at 36% [9]. Although it is predicted to reach as high as 54% in 2030, it is still plagued with distance problems and access to populations in isolated areas. Internet use has been restricted mostly to urban areas, wherein remote and isolated areas remain a big challenge to provide [3], [10]. Hence, widening differences in societal development between some areas.

Regarding its impact, internet has been shown to be pivotal in reducing gaps in social welfare. Even in earlier studies, internet has been demonstrated to be effective in enhancing human capital. Due to a very large and rapidly increasing stock of knowledge, those with internet access can acquire, disseminate and employ new knowledge accordingly [1]. Globally, studies in African continents have given evidence on how internet (along with other devices) promotes inclusive development in sustainable development agenda. Moreover, internet has also been used to reduce the health services divide within developing countries [2].

Despite its positive impact, internet should also be used cautiously. As mentioned in the beginning, internet may also increase the likelihood of deviance and crime. Through its flexibility in concealing personal identity, internet can be used to perform cybercrimes. Although there is no cybercrime data ever reported in the Statistical Yearbook by BPS, other reports in Indonesia show that various types of cybercrime are relatively higher compared to their counter response [11]. Further, online forums and chat rooms can also accommodate deviance to take place offline, such as drug trafficking, terrorism and prostitution [5].

In sum, internet usage helps people acquiring relevant knowledge and skills to become more equipped in education, seeking jobs, health care, business, and above all, alleviating poverty. However, its use should be regulated more carefully in order to maintain its positive changes and restrain its negative effects. At present, internet's societal relevance should focus more on the contribution to the societal development either directly through individual

growth or indirectly through government policy (especially for those in remote and isolated areas) in providing the necessary infrastructures.

B. HDI

According to United Nations Development Programme (UNDP), the HDI is a measure that captures the average achievements in key dimensions of human development: health, education and standard of living [12]. Contrary to the economic growth measures, the HDI was created to measure a country's development in terms of the people and their capabilities. It consists of three dimensions that cover health, education and standard of living. It is important to note that HDI is a simplified form of what human development as a whole concept refers to. It cannot be used to measure other development indicators such as inequality, gender disparity and empowerment. However, HDI is a parsimonious measure for our exploratory study.

Looking solely at the impact of internet use, while putting aside the internet divide debate, we expect that HDI dimensions are largely affected. By being connected to the internet, previous studies have shown that those in less developed areas were able to receive up-to-date knowledge (as well as skills) concerning health practices for health professionals [2]. By this, a country's life expectancy, birth rate and other important indicators in health developmental terms are expected to gradually improve. Further, previous studies in Africa have demonstrated that internet provides inclusiveness in educational sector: those in less developed areas were able to receive the same quality of knowledge as those in more developed areas like on Java island. From a human capital point of view, education and relevant knowledge as well as skills empower people with greater adaptability to labour opportunities [13]. Regarding economic growth, at its core, internet promotes positive development to business sector. Through efficiency (e.g. inexpensive communication cost) and other benefits, internet reshapes the way companies work and communicate with their customers. Taken together, the three dimensions of HDI (i.e. health, education and standard of living) are expected to increase under internet use (*hypothesis 1*).

C. Crime Incidence

In Indonesian Statistical Yearbook, crime incidence is defined as any criminal case reported and received by the police office, including those caught by the police [7]. Crime incidence is recorded as the total number of criminal cases per province. With the increasing use of internet, crime incidence is as equally affected as HDI.

The use of internet indisputably brings contradicting effects to a society. The good side is complaints about alleged crimes using online platforms (e.g. Facebook and Twitter) seem to be a reliable tool for many internet users. In Jakarta, Indonesia, an organization called Qlue was established to work side by side with the government to handle societal matters, ranging from flooding points to crime reports in the city. The bad side, however, internet also facilitates crimes and deviance, especially among young people [5]. It even reinvented ways of committing fraud and identity theft, making them more difficult to solve.

Departing from a positive spectrum of internet impact and its relation to regional growth, we expect that internet use brings more positive changes to crime prevalence in the nation. Through rapid dissemination of information and inexpensive communication, internet users actively engage in social interactions that promote safety to their society. Therefore, on average, we expect that internet use reduces crime incidence (*hypothesis 2*).

III. METHOD

This study uses data published in a recent report of Statistical Yearbook of Indonesia 2018. The data is taken from reliable sources, such as the BPS survey itself, National Labor Force Survey (SAKERNAS: *Survei Angkatan Kerja Nasional*) and National Socioeconomic Survey (SUSENAS: *Survey Sosial Ekonomi Nasional*). The obtained data is then calculated using regression analysis to serve the study purpose. The followings are measures that are employed in this study;

A. Dependent Variable

1) HDI

According to the world bank, the HDI is a geometric mean of three dimensions consisting of health, education and standard of living. The health dimension uses life expectancy at birth for assessment, the education uses number of years of schooling for adults aged 25 years and above and the expected number of years of schooling for children of school-entering age, and the standard of living uses gross national income per capita [12]. The scores for the three HDI dimensions are then calculated using geometric mean.

2) Crime Incidence

Crime incidence is measured as the total number of criminal cases occurring within a certain period of time. The number is by nature continuous, which can range from absolute zero to ten thousands cases.

B. Independent Variable

3) Internet Use

At the stage of rule generation, it is carried out Internet use is measured by a percentage of households who used in the last three months during 2015-2017.

4) Control Variable

To make sure that our results are robust to effects of other important variables, we include unemployment rate and labor participation as our control variables. We will include them in the last model to see if there is any spurious relationship due to their presence.

IV. RESULTS

Table I describes the mean of the three-year period for each province.

Table I starts with the mean values of the dependent variables and continues to the independent variable. As shown above, DKI JKT has the highest HDI value among

provinces in Indonesia which followed by DIY. In contrast, Papua has the lowest HDI value in Indonesia. Further, DKI JKT also has the highest number of crime incidence in Indonesia which followed by Sumut. Malut is the province with the lowest crime incidence. As for internet use, again, DKI JKT sits on top as the province with the highest percentage of internet use. Interestingly enough, Kepri comes as second. Similar to HDI, Papua has the lowest percentage of internet use.

Next, we continue with our main analysis using regression analysis. Since we have data for multiple years, we employ dummy variables for year to allow different starting points in each variable of interest. In other words, allowing every time unit to have a different intercept (heterogeneity in provinces) due to our assumed differences in development of infrastructure, regional income level and other relevant matters that would determine the HDI and crime incidence. Table II and Table III shows the full results.

Employing a step-wise fashion in running the regression, model 1 of Table II shows that the percentage of internet use is positively related to the level of HDI ($b=.37, p<.05$). Therefore, our hypothesis 1 is corroborated. Moving to model 2 of Table II, we take into account the year unit in the model (2015 is the reference category). Interestingly, as shown in model 2, the year 2017 is negatively related to HDI level by large ($b=-2.66, p<.05$).

TABLE I. MEAN FOR EACH PROVINCE IN 2015-2017.

Province	HDI	Crime	Internet Use
<i>Aceh</i>	70.02	8860	18.45
<i>Babel</i>	69.53	1967	24.12
<i>Bali</i>	7374	4462	34.05
<i>Banten</i>	70.88	4421	31.26
<i>Bengkulu</i>	68.62	5078	22.77
<i>DIY</i>	78.29	8430	39.73
<i>DKI Jakarta</i>	79.55	41023	52.47
<i>Gorontalo</i>	66.12	3411	22.30
<i>Jabar</i>	70.08	27446	29.80
<i>Jambi</i>	68.83	9840	22.77
<i>Jateng</i>	70.00	14115	24.89
<i>Jatim</i>	69.65	32979	25.28
<i>Kalbar</i>	65.80	6667	19.86
<i>Kalsel</i>	69.03	6866	27.26
<i>Kalteng</i>	69.15	3031	24.15
<i>Kaltim</i>	74.63	8936	37.24
<i>Kepri</i>	74.00	4483	42.19
<i>Lampung</i>	67.62	10264	17.28
<i>Maluku</i>	67.61	2496	20.49
<i>Malut</i>	66.58	899.7	14.67
<i>NTB</i>	65.86	7309	18.08
<i>NTT</i>	63.18	7084	13.57
<i>Pabar</i>	62.31	5860	21.80
<i>Papua</i>	58.13	3755	12.37
<i>Riau</i>	71.28	8328	27.04

<i>Sulsel</i>	69.75	17592	25.33
<i>Sulteng</i>	67.45	9610	19.49
<i>Sultra</i>	69.31	3426	21.36
<i>Sulut</i>	71.03	8580	29.34
<i>Sumbar</i>	70.65	14801	25.86
<i>Sumsel</i>	67.52	18890	21.11
<i>Sumut</i>	70.03	37406	21.90

Finally, we take into account our control variables in model 3. The levels of unemployment rate and labor participation are not significantly related to HDI level.

TABLE II. REGRESSION MODEL OF INTERNET USE ON HDI (STANDARD ERROR IN PARENTHESES).

Parameter	Model 1	Model 2	Model 3
<i>Intercept</i>	59.87 (0.67)	59.72 (0.63)	60.17 (0.85)
<i>Internet use</i>	0.37 (0.02)	0.42 (0.01)	0.42 (0.02)
<i>Year (2015=ref.)</i>			
2016		-0.67 (0.52)	-0.78 (0.54)
2017		-2.66 (0.56)	-2.80 (0.59)
UR			-0.9 (0.11)
LP			-0.00 (0.00)
<i>Adjusted R²</i>	0.69	0.75	0.75

*. Bold indicates significant at $p < .05$.

TABLE III. REGRESSION MODEL OF INTERNET USE ON CRIME INCIDENCE (STANDARD ERROR IN PARENTHESES).

Parameter	Model 1	Model 2	Model 3
<i>Intercept</i>	2640.20 (2901.40)	2443.50 (3025.60)	580.48 (4045.05)
<i>Internet use</i>	326.40 (107.80)	407.90 (117.90)	400.89 (124.03)
<i>Year (2015=ref.)</i>			
2016		-1219 (2479.6)	-540.46 (2577.05)
2017		-4386.5 (2683.8)	-3980.11 (2823.54)
UR			346.05 (557.40)
LP			-1.34 (1.45)
<i>Adjusted R²</i>	0.07	0.08	0.08

*. Bold indicates significant at $p < .05$.

Based on the results above, first, we show that internet use has a positive relation with HDI. Similar to previous studies, those with internet access are able to acquire, disseminate and employ new stock of knowledge which may

directly or indirectly increase the level of HDI. In terms of health dimension of HDI, internet use allows users from all over the world to exchange knowledge and skills related to health matters [2]. By this, even in less developed areas those with internet access are able to receive the same quality of health information (as well as skills) to improve life expectancy and birth rate. In terms of education, internet use increases chance of receiving higher quality of education to both the institution and the stakeholders (i.e., students, teachers) in less-developed areas of Indonesia. Although we do not test this directly, we assume that positive use of internet to a certain extent may stimulate students' enthusiasm in education, thus, keeping them in school. Finally, in terms of standard of living, presumably working in a similar mechanism as health and education internet use equips people with greater adaptability to labor opportunities by giving access to information, knowledge as well as skills [13]. In turn, people have a greater chance to receive greater income and have greater expense.

Second, internet use is shown to be positively related to number of crime incidence. It is the opposite of what we expected. We argue that internet use in Indonesia, in general, facilitates people to conduct crime and deviance [5]. Although we don't test this directly, we assume internet allows people to roam free while committing crime online and/ offline. Although crime incidence in 2017 seems to be substantially lower, internet use is still strongly related to crime incidence. As argued by [5], internet helps people reinvent ways of committing acts of crimes, which making them more difficult to solve and becoming more prevalent.

Moreover, year 2017 offers an interesting finding. It is shown to be negatively related to HDI level and crime incidence at a significant level. We argue that in the year 2017 there might have been some socio-economic changes that affect Indonesian society in general. These socio-economic conditions might tamper the HDI level, but on the bright side, these conditions help reducing crime incidence.

Further, it is important to note limitations in our study. First, we only look at the heterogeneity across time but not provinces. Thus, it is worth considering looking at the role of internet use in HDI and crime incidence across provinces. Second, we do not take into account plausible factors that may affect internet use and its effects such as level of regional income and regional development rate.

V. CONCLUSION

Taken together, this study is intended to explore the plausible relations between internet use on one hand and level of HDI and crime incidence on the other. We show that internet use can be differentially related to important societal developments in Indonesian society. Not only can it predict better outcome in health, education and income, but it can also relate to higher crime incidence. These results are expected to stimulate other empirical studies on the role of internet in our society which previously taken for granted. In conclusion, internet is shown to play a pivotal role in improving our social welfare but we should also be aware of possible misuse of it.

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