

Journal of Socioeconomics and Development

https://publishing-widyagama.ac.id/ejournal-v2/index.php/jsed



@ @ &

Does human capital spillover affect labor productivity?

Lorentino Togar Laut, Tasya Putri Indra Pranizty, and Rr Retno Sugiharti*

Universitas Tidar, Magelang, Indonesia

*Correspondence email: retno.sugiharti@untidar.ac.id

ARTICLE INFO

ABSTRACT

Research Article

Article History Received 8 June 2022 Accepted 30 March 2023 Published 6 July 2023

Keywords

capital-labor ratio; human capital spillovers; labor productivity; life expectancy

JEL Classification E24; J24; O47 As a developing country, in 2022 Indonesia is the 4th largest population in the world and predicted to experience a demographic bonus in 2020-2035. However, along with the increase in the population and workforce in Indonesia, it turns out that the productivity of the workforce in Indonesia is still low. This study aims to analyze and examine the effect human capital spillovers proxied by higher educated labor and lifetime in-migration on labor productivity in Indonesia along with other production factor variables. This study used panel data collected from 28 provinces in Indonesia in period of 2010 to 2019. Based on the results, the higher the level of education, the higher the productivity and the presence of higher educated labor can provide knowledge spillover for the environment. Meanwhile, human capital spillover from indicators in-migration has no impact on productivity. These results indicate that knowledge spillover support by quality of human capital, but the movement of labor has not provided positive externalities for the surrounding environment.

To cite this article: Laut, L. T., Pranizty, T. P. I., & Sugiharti, R. R. (2023). Does human capital spillover affect labor productivity? Journal of Socioeconomics and Development, 6(1), 36-47. https://doi.org/10.31328/jsed.v6i1.3759

ISSN 2615-6075 online; ISSN 2615-6946 print OUWG Press, 2023

INTRODUCTION

Labor productivity has become a crucial economic indicator due to its tight relevance to competitiveness, economic growth, and standard of living (International Labour Organization, 2020). Workers with high productivity can produce more outputs than workers with low productivity. Labor may encourage economic growth with the existence of improved productivity, while at the same time labor productivity can also attract investment indirectly (Arham, 2019).

Based on data released by International Labour Organization Statistics (2020), from 2010 to 2019, Indonesia was ranked fifth for its labor productivity out of 10 countries members of ASEAN, with average productivity of \$8.110 per worker. This figure indicates that Indonesia is still unable to compete with other members of ASEAN countries, even with the fellow developing countries, such as Malaysia and Thailand. If the labor productivity in Indonesia stays in the lower state, it will be a future potential threat, in particular low competitiveness which leads to low productivity. Once a competitiveness level goes low, economicrelated issues will arise. On the other hand, Indonesia's low quality of workers encourages less optimal economic competitiveness (Adam, 2017). At the same time, the economic competitiveness and economic development in an area might be improved with labor productivity as the primary indicator.

High labor productivity can be actualized when the output is improved through the quality of human capital. Becker (1964) and Schultz (1961) placed the fundamental theory that human capital improvement can be portrayed through proper education and health service, trough empirical analysis associated with the influence of human capital on economic growth and resulted in positive and significant. Human capital is

the characteristics that share contributions towards production, such as knowledge, talent, attitude, skills, and others (Adriani, 2019). Improving the quality of human capital can be achieved through increasing educational attainment (Puspasari & Handayani, 2020; Sugiharti, Islami, & Pramudiastuti, 2021). However, education alone is not enough to encourage labor productivity. Hendarmin & Kartika (2019) verified that the average length of schooling has an insignificant positive relationship to labor productivity, but a negative relationship between education and labor productivity might occur due to the heterogeneity of the research coverage area (Pritchett, 2001; Sugiharti, Sugiyanto, & Kurnia, 2017).

However, the need of education continues, not only at basic education level but higher education as well. On the one hand, Benos & Karagiannis (2016) indicated that workers graduating from higher education positively influence labor productivity. The importance of having a highly qualified human resource, in terms of his high level of education, can improve labor productivity (Arshad & Malik, 2015). On the other hand, research by Putri & Kusreni (2017) demonstrated that workers graduating from higher education have an insignificant negative influence on labor productivity. The insufficient contribution provided by higher education causes an improvement in the number of workers graduating from higher education, leading to a decrease in labor productivity (Baharin et al., 2020).

Humans originated with social characteristics, meaning that human needs interaction with others. The past interaction between economic agents may support productivity in present time (Fauziah, Khoirunurrofik, Isnaeni, & Khoirunurrofik, 2020). During socializing and interacting, knowledge exchange is common to happen. Human capital is formed from knowledge spillovers which is seen as a tool for continuous progress and development (Chang, Wang, & Liu, 2016). Spillovers are important when new knowledge is available, and correctly applying a certain level of experimentation is required (Parman, 2012).

The knowledge spillovers can improve labor productivity due to exchanging ideas that lead to more insights. Mahony & Riley (2012) stated that knowledge exchange between workers is believed to be an important driver of economic growth. Knowledge spillovers are defined as interchangeable knowledge as an effect of interactions among individuals, later can be called capital spillovers (Salam, & Prishardoyo, 2018). The interaction might be in the form of people's migration, investment flow, and goods and service flow traded over areas. It can also be in the form of well-educated workers (Susanto & Welly Udjianto, 2019).

Since the interaction is capable of escalating labor productivity, recently economists and policy makers have been paying attention to spillover and the effect of spillover on the growth of an economy (Rahmayani, Sugiyanto, & Kurnia, 2017). Zheng & Du (2020) stated that human capital spillovers became one of the most important inputs in the economy, because if skilled human resources are increasing and abundant, it will lead to a high level of entrepreneurship. The impact of spillovers not only increases human resources in local area, but also the surrounding area. The development of the economy in an area not only makes an increase in the prosperous population in the area, but also affects the welfare of the population in the surrounding area (Susanto & Welly Udijanto, 2019).

Moretti (2004) explained the basis of the formation human capital spillovers from the view of spatial balance, which assumed that firms in urban areas are dependent on the overall level of human capital in cities, by comparing workers with higher education degrees in firms and cities. When a company employs skilled workers, the productivity increases. Moretti's (2004) research also showed that along with the increase in the proportion of educated workers employed, the impact on productivity is not direct, but the effect of the proportion of college graduates in urban areas will make human capital spillovers have a positive effect on increasing, until finally the productivity of all companies also increases.

The movement of people from one place to another is also a driving factor for spillover, which has a positive and significant to economic growth (Purnomo et al., 2019). In-migration promotes economic growth due to population growth. Hence, people's growth leads to improved production of goods and services due to increased consumption. Dewi & Idris (2019) suggested that in-migration has an insignificant negative influence on economic growth. The increase of in-migration triggers a decrease in economic growth (Susanti et al., 2015). Support to relationship between migration and spillover also came from research by Zheng & Du (2020) concluding that from mega-urban agglomerations of integrated cities strong spillover.

Many previous researches were done in analyzing human capital spillover, especially in how knowledge can be spread over the community trough empirical model (Benos & Karagiannis, 2016; Fauziah et al., 2020; Kaur & Singh, 2016; Rahmayani et al., 2017), including modelling spillover by using input- output table and geographic distance between regions to create the weight matrix in spatial econometric estimation (Kuswardana, Djalal Nachrowi, Aulia Falianty, & Damayanti, 2021). However, there is still few research focused on analyzing spillover from the perspective of high level of education and workers mobility. This research is focused on the human capital spillovers and the effect on labor productivity from 2010 to 2019 by employing the data panel regression. Overall, the research hypothesis tries to reveals that human capital spillovers positively influence labor productivity in Indonesia. It is expected that the research will be beneficial to the government in formulating policies related to improving labor productivity in Indonesia.

RESEARCH METHOD

This research employed the quantitative approach using purposive sampling. Due to data limitations and the needs of minimizing data heterogeneity, only 28 out of 34 provinces were included in the observations. The data were derived from the literature studies and sourced from Indonesia's Statistics Center (BPS) during 2010-2019. Panel data analysis was applied as the analysis technique with the support of Stata v16 to process the data.

This research followed the economic growth model proposed Hall & Jones (1998) which determined that the production function includes its constant return to scale at the time of t, therefore:

$$Y(t) = K(t)^{\alpha} [A(t)H(t)]^{1-\alpha}$$
(1)

In which K represents capital, A is the level of knowledge or insights representing workers' effectiveness, and H represents total labor productivity at every skill level. Later, both above equations were divided by Lt and written in the logarithm form to decipher the output difference per worker and reveal the capital contribution per worker while A is considered constant. Then the model was formulated as follows.

 $\dot{y} = \alpha \dot{k} + (1 - \alpha) \dot{h}$ ⁽²⁾

Here, the human capital (\dot{h}) was proxied by two factors, which were health and human capital spillovers. Thus, \dot{h} can be decomposed as follows:

$$\dot{y} = \beta_0 + \beta_1 \dot{k} + \beta_2 \text{health} + \beta_3 \text{human capital spillovers}$$
(3)

Since the model was based on production function developed by Hall & Jones (1998), this research used capital-labor ratio as proxy of Stock Capital (\dot{k}) (Hendarmin, 2019; Todaro & Smith, 2011). Capitallabor ratio is defined as the proportion of utilization on physical investment and labor is calculated as the ratio of capital and labor utilization. Here, capital-labor ratio and technology are interrelated. More modern machines can be bought using available capital (Ismail, 2015). The capital-labor ratio can be applied to identify the physical capital in an area, which is essential for productivity improvement.

Not only in identifying proportion physical investment and labor, capital-labor ratio also play important roles in labor productivity. Related research from Yuniasih et al. (2013) explained that labor productivity can be escalated by physical capital stock for 0.05%. When capital and workers are acknowledged only as a replacement input for the economy overall, it can hinder labor productivity from improving to maximum (Arshad & Malik, 2015). Research from Ismail (2015) implied the positive and significant influence of the capital-labor ratio on labor productivity.

As proxy of health, life expectancy was used. Studies by Sudirman & Ahmadi (2014), Putri & Kusreni (2017), Hendarmin & Kartika (2019) and Puspasari & Handayani (2020) indicated the enhancement of labor productivity when life expectancy that measures the health level increases and the low access to health makes life expectancy unable to improve labor productivity significantly. Mehmood et al. (2022) stated that life expectancy shares a positive and significant influence on labor productivity.

To capture education and human capital spillover, this research used average years of schooling (Purnomo et al., 2019), the workers graduating from previous higher education (Benos & Karagiannis, 2016), and a lifetime in-migration (Purnomo et al., 2019).

With the panel data in the equation, the model was formulated as follows.

$$lnPTK_{it} = \beta_0 + \beta_1 lnCLR_{it} + \beta_2 lnAHH_{it} + \beta_3 lnRLS_t + \beta_4 lnPPT_{it} + \beta_5 lnMSU_{it} + \epsilon_{it}$$
(4)

In which InPTK is labor productivity, InCLR is the capital-labor ratio, InAHH is life expectancy, InRLS is the average length of schooling, InPPT is workers graduating from the higher education, InMSU is lifetime in-migration, β_0 is a constant, β_1 is the coefficient of InCLR, β_2 is the coefficient of InAHH, β_3 is the coefficient of InRLS, β_4 is the coefficient of InPPT, β_5 is the coefficient of InMSU, ϵ is the error term, *i* is the cross-section, and *t* is the time series. Meanwhile, β_1 , β_2 , β_3 , β_4 , $\beta_5 > 0$, was hypothesized to be positively related to labor productivity. This coefficient would show empirical evidence of human capital spillovers on labor productivity in Indonesia in 2010-2019.

RESULT AND DISCUSSION

Human Capital Quality in Indonesia

To capture the condition of human capital in Indonesia, the HDI value was utilized with the consideration that it is a measure of human development achievement based on a number of basic components of the quality of health indicators, education levels and economic indicators. This measurement used three basic dimensions: length of life, knowledge, and a decent standard of living.

From Table 1, it can be seen that every year the average HDI number in Indonesia had a small increase, from 69.75 in 2017, to 70.38 in 2018 and 71.04 in 2019. From Table 1, it can be seen that provinces in Western Indonesia (Bali, Banten and below) had higher HDI than provinces located in Eastern Indonesia, with an average HDI of 73.04 for provinces in Western Indonesia, and 96.03 for provinces in Eastern Indonesia (2019 data). The trend of inequality between the western and eastern regions of Indonesia cannot be denied, however, to overcome inequality.

Descriptive Analysis

This research included 280 people originating from 28 provinces in Indonesia. Data were taken from 10year timespan, starting from 2010 to 2019. Table 2 shows that a total of 280 observations was used in this research with an average labor productivity in Indonesia of 3.999352, a minimum labor productivity (InPTK) of 3.057298 and a maximum of 4.498364. Capital-labor ratio (InCLR) had an average value of 2.836149, minimum value of 1.916923 and maximum of 3.560478. Health seen from life expectancy (InAHH) shows an average value of 4.231753, where the minimum value was 4.135167 and the maximum value was 4.316421. The average length of schooling (InRLS) had an average value of 2.050746, the minimum value of 1.720979 and the maximum value of 2.283402. The average value of workers who completed higher education (InPPT) was 12.28370, with minimum score of 10.19973 and maximum score of 14.74547. The average population migrating for life (InMSU) was 12.89262, with a minimum score of 10.96414 and a maximum value of 15.58892. It can be concluded that the value generated by mean is larger than the value generated by the standard of deviation.

Table 1.	Indonesian	Human	Development	Index	by
	Province				

Province	2017	2018	2019
Aceh	70.60	71.19	71.90
North Sumatera	70.57	71.18	71.74
West Sumatera	71.24	71.73	72.39
Riau	71.79	72.44	73.00
Jambi	69.99	70.65	71.26
South Sumatera	68.86	69.39	70.02
Bengkulu	69.95	70.64	71.21
Lampung	68.25	69.02	69.57
Bangka Belitung Islands	69.99	70.67	71.30
Riau Islands	74.45	74.84	75.48
DKI Jakarta	80.06	80.47	80.76
West Java	70.69	71.30	72.03
Central Java	70.52	71.12	71.73
DI Yogyakarta	78.89	79.53	79.99
East Java	70.27	70.77	71.50
Banten	71.42	71.95	72.44
Bali	74.30	74.77	75.38
West Nusa Tenggara	66.58	67.30	68.14
East Nusa Tenggara	63.73	64.39	65.23
West Kalimantan	66.26	66.98	67.65
Central Kalimantan	69.79	70.42	70.91
South Kalimantan	69.65	70.17	70.72
East Kalimantan	75.12	75.83	76.61
North Sulawesi	71.66	72.20	72.99
Central Sulawesi	68.11	68.88	69.50
South Sulawesi	70.34	70.90	71.66
Southeast Sulawesi	69.86	70.61	71.20
Gorontalo	67.01	67.71	68.49
West Sulawesi	64.30	65.10	65.73
Maluku	68.19	68.87	69.45
North Maluku	67.20	67.76	68.70
West Papua	62.99	63.74	64.70
Рариа	59.09	60.06	60.84

Human Capital Spillover to Labor Productivity

Panel Regression was estimated using 2 methods: Fixed Effect Model (FEM) and Random Effect Model (REM). In the preliminary test to select the appropriate model using the Hausman test, Fixed Effect Model (FEM) was considered a better model than others. However, after accomplishing the classic assumption test, it was revealed that the result showed an unsatisfying result. To solve this, the Fixed Effect Model (FEM) was corrected using the robust standard error and Random Effect Model was corrected using Maximum Likelihood Estimation (Wooldridge, 2016). The final estimation result from the Akaike Information Criterion (AIC) value showed that the Random Effect Model (REM) method improvement (Random_RSE) is the best model. The estimation

Table 2. Descriptive Statistics Analysis

results can be seen in Table 3.

Variable	Obs	Mean	Std. Dev.	Min	Max
InPTK	280	3.999	0.29	3.057	4.498
InCLR	280	2.836	0.327	1.917	3.56
InAHH	280	4.232	0.037	4.135	4.316
InRLS	280	2.051	0.11	1.721	2.283
InPPT	280	12.284	0.99	10.2	14.745
InMSU	280	12.893	0.965	10.964	15.589
InPTK is labor productivity In(InCLR is the	canital-lah	or ratio

LnPTK is labor productivity, InCLR is the capital-labor ratio, InAHH is life expectancy, InRLS is the average length of schooling, InPPT is workers graduating from the higher education, and InMSU is lifetime in-migration.

Based on Table 3, the goodness of fit model has been fulfilled with a significant value of the probability goodness of fit test (F-test, Wald Chi2, LRChi2). The smallest AIC value is shown by the Random Robust model (-783.2) meaning that of the 4 estimated models, the Random-RSE model is the best model.

Overall, the estimation results in Table 2 show that capital-labor ratio (InCLR), life expectancy, and average length of schooling (InRLS), and workers who complete higher education (InPPT) had a positive significant influence on labor productivity. However, lifetime in-migration (InMSU) had no significant and negative influence on labor productivity. More indepth discussion is presented in the next section.

Human capital spillover to Labor Productivity

This research focuses on the productive workforce. As defined by BPS in 2022, the productive age is ranged from 15 to 64 years old. The age range of 7 to 14 years old and above 65 are excluded from the productive workforce category and this research. Yet, it is possible that people in the latter age ranges perform economic activities that produce a certain output. Besides, the utilization of GRDP in calculating Sugiharti et al., Does human capital spillover affect labor...

labor productivity was carried out by dividing the total GRDP by workers. Thus, it calculated the productivity of a single input, which is workers.

Table 3. Estimation Result

	(1) Fixed	(2) Random	(3) Fixed_RSE	(4) Random_ RSE
main				
Inclr	0.399***	0.462***	0.399***	0.450***
	(0.0370)	(0.0346)	(0.120)	(0.0362)
Inahh	5.111***	2.560***	5.111***	2.892***
	(1.160)	(0.811)	(1.834)	(0.919)
Inrls	0.197	0.373**	0.197	0.365**
	(0.214)	(0.151)	(0.362)	(0.156)
Inptt	0.0469*	0.0454**	0.0469	0.0455**
	(0.0273)	(0.0228)	(0.0448)	(0.0231)
Inmsu	-0.00303	-0.00134	-0.00303	-0.00436
	(0.0325)	(0.0248)	(0.0378)	(0.0255)
cons	-19.70***	-9.449***	-19.70**	-10.77***
	(4.644)	(3.179)	(7.147)	(3.620)
sigma_u				
cons				0.200***
sigma_e				(0.0299)
cons				0.0445***
				(0.00201)
AIC	-970.6		-972.6	-783.2
F test	318.10***		110.72***	
Wald chi ²		1533.91***		
LR chi ²				516.97***

Standard errors in parentheses

* p < 0.1, ** p < 0.05, *** p < 0.01

LnPTK is labor productivity, InCLR is the capital-labor ratio, InAHH is life expectancy, InRLS is the average length of schooling, InPPT is workers graduating from the higher education, and InMSU is lifetime in-migration

The estimation result of the main production factor variable, namely capital, showed significant influence on labor productivity. From coefficient value it can be concluded that each 1% raise of the capital-labor ratio increased 0.4503865 % of labor productivity, ceteris paribus. The probability value was 0.0000, lower than the significance level of $\alpha = 0,05;5\%$. This confirm that the more intensive a capital owned by a company, the more productive a company will be. This result is supported by Afrooz, (2011); Afrooz, Rahim, Noor, & Chin (2010); Ismail, (2015). The capital-labor ratio is connected to need of technology. Hence, a company requires technology to improve its production. It causes more expenses in accommodating the company with more new and advanced machines. Once a company is equipped with new and advanced machines, skilled workers are automatically required to operate those machines, and productivity will be leveled up.

This research result is aligned with Solow's growth theory. Solow in Hall & Jones (1999) and Mankiw, Romer, & Weil (1992) explained that in certain technology circumstances, if the utilization of the capital-labor ratio increases, the output per worker of labor productivity will improve. If the available funds can be used to increase the capital-labor ratio through an increase in the production process, it can be predicted that labor productivity will relatively grow faster (Markhaichuk, Panshin, & Chernov, 2022).

Table 4. The Average Workers Graduating from Higher Education for 28 provinces in Indonesia, 2010 to 2019

Year The Average of Workers Graduating from Higher Education 2010 251,860 2011 268,223 2012 302,787 2013 319,163 2014 343,633		
Higher Education 2010 251,860 2011 268,223 2012 302,787 2013 319,163 2014 343,633	Year	The Average of Workers Graduating from
2010 251,860 2011 268,223 2012 302,787 2013 319,163 2014 343,633	rear	Higher Education
2011 268,223 2012 302,787 2013 319,163 2014 343,633	2010	251,860
2012 302,787 2013 319,163 2014 343,633	2011	268,223
2013 319,163 2014 343,633	2012	302,787
2014 343,633	2013	319,163
	2014	343,633
2015 383,389	2015	383,389
2016 446,648	2016	446,648
2017 452,034	2017	452,034
2018 462,638	2018	462,638
2019 487,146	2019	487,146

Source: BPS (2022)

The quality of human capital as indicated by life expectancy shows that life expectancy had a positive influence on labor productivity. From the coefficient value, it can be concluded that each raise of 1% in the life expectancy increased 2.892287 % of labor productivity, ceteris paribus. The probability value was 0.002, lower than the significance level of $\alpha = 0,05;5\%$. Therefore, it can be verified that life expectancy significantly influenced labor productivity.

The rate of life expectancy, which had a positive and significant influence on labor productivity, is aligned with the research conducted by Putri & Kusreni (2017) which demonstrated that life expectancy numbers have positive and significant effects on labor productivity in 33 provinces in Indonesia, in 2008-2012. The research explained that life expectancy is considerably high if an area is occupied with good health conditions. The health condition highly determines one's productivity. Since health is the crucial basic factor in improving productivity, selfdevelopment and life quality improvement will be highest if a person is healthy. A person will often present for work because he is in good condition. On the contrary, a person's productivity will be jeopardized once he has a bad health condition.

Automatically, such condition impacts performance and disturbs the output production.

This research result is also supported by Arshad & Malik (2015) that health is the most influential human capital for labor productivity in Malaysia. When a person is in his best physical and spiritual condition, he becomes more productive, earns more payments, and is seldom absent from work. This condition can improve productivity significantly. This statement is also supported by Todaro & Smith (2003) who revealed that workers with good health quality lead to enhanced productivity since the outputs are also significantly improved.

Life expectancy for 28 provinces in Indonesia is still categorized as low, even though every year it keeps increasing. This condition demonstrates the improvements made by the government in terms of the health system and services in Indonesia.

The first human capital spillover indicator, which is average length of schooling, proved to significantly influence labor productivity with a coefficient of 0.3653544. It can be concluded that each raise of 1% in the average length of schooling increased 0.3653544 % for labor productivity, ceteris paribus. The probability value was 0.019, lower than the significance level of $\alpha = 0.05$; 5%.

This positive and significant result for the average length of schooling is supported by Puspasari & Handayani (2020) who stated that the average length of schooling promoted the labor productivity in Central Java from 2010 to 2015 by 0,42%. From the research, it can be notified that human resource quality influences labor productivity, as reflected in health and education quality. A person with higher education can accomplish better productivity based on the assumption that higher education leads to better capability, skill, and insights. These elements could encourage labor productivity.

This result is also supported by Oktavia et al. (2017) who put forward that the average length of schooling positively and significantly influences labor productivity in Sumatera. In agriculture, the condition of the average length of schooling tends to be stagnant—all similarly accomplished 6 years of education, equal to elementary school graduates. The average length of schooling in the agriculture sector increases each year. In 2010, it recorded an average of 6.39 and increased to 6.59 years in 2014. Even though the average length of schooling is documented as low, productivity can be increased. It signifies that

Education in Indonesia demonstrates consistent improvement. The government has to continue accommodating various programs and aids for all people, so they can easily access education-related items to encourage an improved average length of schooling.

The second spillover indicator was the workers graduating from higher education. This variable significantly influenced labor productivity with a coefficient of 0.045478. Therefore, it can be concluded that each raise of 1% in the variable of workers graduating from the higher education increased 0.045478 % of labor productivity, ceteris paribus. The probability value was 0.049, lower than the significance level of a=0,05;5%. Hence, it can be verified that the average length of schooling insignificantly influences labor productivity. Education and training are the key factors. Knowledge, education, and training will be a valuable addition to skills while working, to escalate the labor productivity. The results in this study are also in line with research from Benos & Karagiannis (2016) which estimated the role of human capital towards productivity and showed that human capital has a strong positive association with labor productivity through upper secondary and tertiary education. Chang et al. (2016) also supported this research that higher-educated employees will increase the productivity, which gets higher under greater technology intensity. Meanwhile, research from Susanto & Welly Udjianto (2019) had a different result since they included spatial aspect in their model, that college-educated worker was proved to have no significant effect on human capital.

From the research of Arshad & Malik (2015), it is reported in Malaysia that workers who have accomplished higher education with improper skills occupy the available job opportunity. More than 40% of companies have reported such events. The study of Muhson et al. (2012) proves that the work assignment is totally different from the study major, which is an education major. Yet, the occupation is still related to the economy.

From Table 5, it can be concluded that the number of workers graduating from higher education tends to increase each year in 28 Indonesian provinces. It is important to know that spillovers require skilled workers or an exchange of knowledge to occur, where most of the causes of the spillover effect are skilled workers interacting with each other (Chang et al., 2016). This means that the existence of highly educated workers is able to provide knowledge spillover to the surrounding environment. However, as stated in Indonesia Development Forum (IDF) (2019), it is necessary to watch out for the tendency of the skills of workers who graduated from higher education to be similar to those of workers graduating from their senior high school. In this case, a competence certification is necessary for workers for acknowledgment of expertise.

Table 5. The Average of Lifetime In-migration for 28 provinces in Indonesia, 2010 to 2019

Year	The Average of Lifetime In-migration
2010	700,949
2011	637,887
2012	647,768
2013	619,125
2014	654,231
2015	645,073
2016	647,766
2017	721,666
2018	762,008
2019	758,161

Source: BPS (2022)

The third variable in capturing human capital spillover was lifetime in-migration. Lifetime in-migration did not influence labor productivity with a coefficient of -0.008587. Therefore, it can be concluded that each raise of 1% in the variable of lifetime in-migration increased 0.008587% of labor productivity, ceteris paribus. The probability value was 0.7066, which is bigger than the significance level of $\alpha = 0.05$; 5%. Hence, it can be verified that lifetime in-migration insignificantly influences labor productivity.

Lifetime in-migration that influences labor productivity negatively and significantly is in line with the research by Dewi & Idris (2019). Based on the research, the negative impact of migration can influence economic growth, as referred to by the migration theory. Despite giving a positive impact, such as improving economic growth, it more often delivers bad effects. Every time migrants penetrate an area, they can take over the available job opportunities from local workers. The local inhabitants can lose their jobs, and human resources quality can be reduced. That occurrence may weaken economic growth. Once it decreases, labor productivity will automatically decline. Both of them are theoretically connected. Therefore, if lifetime in-migration negatively influences economic growth, it applies similarly to labor productivity.

From the scatter plot graph in Table 6, it is confirmed that there is no unidirectional pattern between lifetime in-migration and labor productivity, indicating neither correlation nor regression.

Table 6. The Average of Lifetime In-migration in 5 Main Islands in Indonesia, 2010 to 2019

Island Name	The Average of In- migration
Sumatera Island	578,557
Java Island	2,007,750
Kalimantan Island	424,073
Sulawesi Island	281,382
Papua Island	114,779
Source: BPS (2022)	

By referring to the condition of lifetime inmigration for 28 provinces in Indonesia, it can be described that the figure shows a trend of improvement. But along with that, it even decreases labor productivity insignificantly. That occurrence happened due to the difference in impact received by each region. According to Dewi & Idris (2019), urban areas will mostly suffer from migration. At the same time, other smaller areas receive an insignificant impact. This phenomenon is implied by the centralization of people who immigrates to Java and Sumatera Island.

Lifetime in-migration in Indonesia is still unevenly distributed and centralized in Java and Sumatera islands. This uneven distribution causes Indonesia difficulties in tackling the impacts due to the migration. When an area is unprepared to deal with this phenomenon, a negative impact will occur. As revealed in the research by Dewi & Idris (2019), their entries will cost the existing workers to lose their jobs. The workers become less productive, and the quality will decrease; they no longer earn the income and find it difficult to fulfill daily needs. Once labor productivity declines, the economy will be directly affected, leading to decreased economic growth. Therefore, a control towards lifetime migrants should be managed and centralized only in a certain area and should be evenly distributed to other regions.

Research Implication

Based on the results, there are implications given by this study. First, since the capital-labor ratio has a positive and significant effect on labor productivity, it is important to make policies that include increasing the capital used (Ismail, 2015). What can be done is to continue to make equal distribution of infrastructure development and investment, especially for those outside Java Island. With this equal distribution, it is hoped that there will be greater job opportunities because the more investment is done, the more the equipment or technology will increase and qualified workers will be needed to operate the technology, leading to a higher absorption of labor and production output. In addition, the government must continue to ensure that industry in Indonesia implements a laborintensive system in order to minimize the risk of reducing workforce.

Moreover, life expectancy has a significant positive effect on labor productivity. Health will have an impact on the macroeconomy of a country, so a commitment is needed to overcome health problems. Investment in health needs to be increased so that health system can function properly (Mehmood et al., 2022). The government must continue to make improvements to the quality and quantity of health services, complete facilities and infrastructure that support health, carry out examinations for pregnant women and infants to prevent additional maternal and infant mortality, check child nutrition to prevent stunting, and monitor Posyandu (health monitoring facilities for mothers and children). In addition, existing government programs such as the National Health Insurance (JKN) in the form of BPJS and KIS are further optimized so that those who receive health assistance are more targeted. Improvements in the quality of health services can simplify the treatment process.

Meanwhile, in the field of education, the average length of schooling has a positive and significant effect on labor productivity. The government must continue to strive to make a policy that is able to improve the quality of education (Puspasari & Handayani, 2020). Programs that have been carried out by the government, such as the 12-year compulsory education program, need to be optimized. In addition, it is necessary to make equal distribution of educational facilities and infrastructure, especially for remote areas and reduce the development gap for private and public schools so that all people can access education easily and get the same facilities.

To maintain spillover from educated workforce, the government must continue to provide scholarship assistance to prospective students who excel but are hampered by economic conditions that makes it difficult for them to continue their studies. In addition, improvements to higher education facilities and infrastructure need to be carried out. It can be carried out by providing access for urban areas to make it easier for educated workers who want to continue their education (Zheng & Du, 2020). When a person takes higher education, the knowledge and insights are more developed than others who do not. By taking higher education, a mindset is formed to be more advanced, making it easier for one to handle a certain task, which leads to labor productivity improvement. There is a need for training and competency certification for workers so that their skills can be recognized, and later they can get a better job according to his skills. In order for this to be implemented, the government's role is urgently needed to build a cooperative relationship with related institutions to improve the competence of quality graduates (Puspasari & Handayani, 2020). This research focuses on workers graduating from higher education on overall labor productivity. For future research, the human capital spillovers variable that is proxied with the workers graduating from higher education can be separated as the level of education. Hence, the impact of human capital spillovers can be identified more comprehensively to recognize which level of higher education influences labor productivity the most.

Lastly, in-migration for life has no effect on labor productivity, so it is necessary to control and equalize the people who want to migrate. If in-migration in an area is not controlled, it will cause various negative impacts. This can be done by increasing the potential resources owned by each region in Indonesia so that migrants do not only choose certain areas such as Java Island and Sumatra Island. According to Purnomo et al. (2019), human resources must be balanced both in terms of quality and quantity. Therefore, it is necessary to put restrictions on ungualified migrants to enter an area to reduce population density. Lifelong in-migration can increase labor productivity because there will be an exchange of information or knowledge that increases the knowledge of the local community.

Sugiharti et al., Does human capital spillover affect labor...

CONCLUSION AND SUGGESTION

The average length of school and higher education workers has a significant effect on labor productivity, while lifetime in-migration as one of human capital spillover indicator has no significant effect on labor productivity in Indonesia. It can be concluded that the effect of human capital spillovers in Indonesia is achieved by education channel. Migration alone is not enough to generate human capital spillover. It is related to poor quality of human resources and the centralization of the migrants only in Java and Sumatra Islands. When there are workers who migrate and settle from one area to another, there is no guarantee that those migrant workers have a good quality of human capital. In some cases, migration from rural to urban areas (urbanization) carries a high externality due to the low quality of labor from rural areas moving to cities. But, the level of education embodied in the workforce is proven to be able to generate human capital spillover. Therefore, the government needs to focus its efforts by making policies to improve the quality of education to support of human capital spillover. Further research is expected to be able to use the variable for workers who have graduated from higher education by separating the levels of higher education in order to know specifically which levels of higher education have an effect on labor productivity.

REFERENCES

- Adam, L. (2017). Membangun daya saing tenaga kerja indonesia melalui peningkatan produktivitas. Jurnal Kependudukan Indonesia, 11(2), 71. https://doi.org/10.14203/jki.v11i2.205
- Adriani, E. (2019). Pengukuran modal manusia (suatu studi literatur). J-MAS (Jurnal Manajemen Dan Sains), 4(1), 176. https://doi.org/10.33087/jmas.v4i1.86
- Afrooz, A. (2011). Total factor productivity in food industries of Iran. International Journal of Economics and Finance, 3(1), 47–51. https://doi.org/10.5539/ijef.v3n1p84
- Afrooz, A., Rahim, K. B. A., Noor, Z. B. M., & Chin, L. (2010). Human capital and labor productivity in food industries of Iran. International Journal of Economics and Finance, 2(4), 47–51. https://doi.org/10.5539/ijef.v2n4p47
- Arham, M. A. (2019). Faktor-faktor Pendorong Produktivitas Tenaga Kerja dan Tantangannya di

Indonesia. In Bunga Rampai Rekomendasi Kebijakan Ekonom Kementerian Keuangan Tahun 2019 (1st ed., Vol. 1, pp. 43–69). Jakarta: Badan Kebijakan Fiskal Kementerian Keuangan. https://doi.org/10.24036/jkep.v1i4.7753

- Arshad, M. N. M., & Malik, Z. A. (2015). Quality of human capital and labor productivity: A case of Malaysia. International Journal of Economics, Management and Accounting, 23(1), 37–55. Retrieved from https://journals.iium.edu.my/enmjournal/index.ph p/enmj/article/view/289
- Baharin, R., Syah Aji, R. H., Yussof, I., & Saukani, N. M. (2020). Impact of human resource investment on labor productivity in Indonesia. Iranian Journal of Management Studies, 13(1), 139–164. https://doi.org/10.22059/IJMS.2019.280284.6736 16
- Becker, G. S. (1964). Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education. New York: National Bureau of Economic Research, Columbia University Press.
- Benos, N., & Karagiannis, S. (2016). Do education quality and spillovers matter? evidence on human capital and productivity in Greece. Economic Modelling, 54, 563–573. https://doi.org/10.1016/j.econmod.2016.01.015
- BPS (Badan Pusat Statistik). (2022). Analisis Profil Penduduk Indonesia. BPS Pusat, Jakarta
- Chang, C.-F. F., Wang, P., & Liu, J.-T. T. (2016). Knowledge spillovers, human capital and productivity. Journal of Macroeconomics, 47(B), 214–232. https://doi.org/10.1016/j.jmacro.2015.11.003
- Dewi, E. P., & Idris, I. (2019). Pengaruh tenaga kerja, migrasi masuk dan pembangunan manusia terhadap pertumbuhan ekonomi di Indonesia. Jurnal Kajian Ekonomi dan Pembangunan, 1(2), 251. https://doi.org/10.24036/jkep.v1i2.6168
- Fauziah, N., Khoirunurrofik, I., Isnaeni, N. F., & Khoirunurrofik, K. (2020). The effect of knowledge spillovers and human capital through technological intensity on employment growth in Indonesia. Asia-Pacific Journal of Regional Science, 5(0123456789), 21–39. https://doi.org/10.1007/s41685-020-00174-4
- Hall, R. E., & Jones, C. I. (1998). Why Do Some COuntries Produce So Much More Output Per Worker That Others? In NBER Working Paper Series (No. 6564). Cambridge. https://doi.org/10.3386/w6564

- Hall, R. E., & Jones, C. I. (1999). Why do some countries produce so much more output per worker than others? Author (s): Robert E. Hall and Charles I. Jones Published by: Oxford University Press. Quarterly Journal of Economics, 114(1), 83–116.
- Hendarmin, H. (2019). Menelusuri kembali peran investasi modal manusia dan modal fisik dalam meningkatkan pertumbuhan produktivitas. Jurnal Ekonomi Bisnis Dan Kewirausahaan, 8(3), 216. https://doi.org/10.26418/jebik.v8i3.29813
- Hendarmin, H., & Kartika, M. (2019). The relationship between human capital and the regional economy productivity. Jejak, 12(1), 138–152. https://doi.org/10.15294/jejak.v12i1.18396
- Indonesia Development Forum (IDF). (2019). Mission Possible: Memanfaatkan Peluang Pekerjaan Masa Depan untuk Mendorong Pertumbuhan Inklusif.
- International Labour Organization. (2020). Statistics on Labour Productivity.
- International Labour Organization Statistics. (2020). Output per Worker (GDP Constant 2010 US \$) --ILO Model Estimates, Nov. 2020 - Annual.
- Ismail, R. (2015). Impact of foreign workers on labour productivity: Analysis of firm level data. International Journal of Productivity and Quality Management, 16(1), 36–53. https://doi.org/10.1504/IJPQM.2015.070191
- Kaur, M., & Singh, L. (2016). Knowledge in the economic growth of developing economies. African Journal of Science, Technology, Innovation and Development, 8(2), 205–212. https://doi.org/10.1080/20421338.2016.1147207
- Kuswardana, I., Djalal Nachrowi, N., Aulia Falianty, T., & Damayanti, A. (2021). The effect of knowledge spillover on productivity: Evidence from manufacturing industry in Indonesia. Cogent Economics and Finance, 9(1). https://doi.org/10.1080/23322039.2021.1923882
- Mahony, M. O., & Riley, R. (2012). Human capital spillovers: The importance of training. INDICSER Discussion Paper, 2.4(December).
- Mankiw, N. G., Romer, D., & Weil, D. N. (1992). A contribution to the empirics of economic growth. The Quarterly Journal of Economics, May, 408=437.

https://doi.org/10.1016/j.jpolmod.2014.01.001

Markhaichuk, M. M., Panshin, I. V., & Chernov, V. G. (2022). Impact of budget investment on labor productivity in resource models of intellectual capital (on the Example of Russian Regions)*. Montenegrin Journal of Economics, 18(2), 191– 202. https://doi.org/10.14254/1800-5845/2022.18-2.16

- Mehmood, A., Siddique, H. M. A., & Ali, A. (2022). Impact of health on worker productivity: evidence from South Asia. Bulletin of Business and Economics, 11(2), 1–8. https://doi.org/10.5281/zenodo.6584755
- Moretti, E. (2004). Workers' education, spillovers, and productivity: evidence from plant-level production functions. The American Economic Review, 94(3), 656–690. https://doi.org/10.1257/0002828041464623

heen A Wabyuni D. Cuprivante & Mulyan

- Muhson, A., Wahyuni, D., Supriyanto, & Mulyani, E. (2012). Analisis relevansi lulusan perguruan tinggi dengan dunia kerja. Jurnal Economia, 8(1), 42–52. https://doi.org/10.21831/economia.v8i1.800
- Oktavia, A., Zulfanetti, & Yulmardi. (2017). Analisis produktivitas tenaga kerja sektor pertanian di Sumatera. Jurnal Paradigma Ekonomika, 12(2), 49–56.

https://doi.org/10.22437/paradigma.v12i2.3940

- Parman, J. (2012). Good schools make good neighbors: Human capital spillovers in early 20th century agriculture. Explorations in Economic History, 49(3), 316–334. https://doi.org/10.1016/j.eeh.2012.04.002
- Pritchett, L. (2001). Where has all the education gone? The World Bank Economic Review, 15(3), 367– 391. Retrieved from http://www.jstor.org/stable/3990107
- Purnomo, S. D., Istigomah, & Suharno. (2019). The Effect of human capital and human capital spillover on economic growth. International Conference on Rural Development and Enterpreneurship 2019: Enhancing Small Busniness and Rural Development Toward Industrial Revolution 4.0, 518-524. Retrieved from 5(1), http://jp.feb.unsoed.ac.id/index.php/Icore/article/ viewFile/1512/1523
- Puspasari, D. A., & Handayani, H. R. (2020). Analisis pengaruh pendidikan, kesehatan, dan upah terhadap produktivitas tenaga kerja di provinsi Jawa Tengah. Jurnal Dinamika Ekonomi Pembangunan, 3(1), 65–76. https://doi.org/10.14710/jdep.3.1.65-76
- Putri, Y. A. K. D., & Kusreni, S. (2017). Analisis pengaruh tingkat kesehatan, tingkat pendidikan, dan upah terhadap produktivitas tenaga kerja di Indonesia. Jiep, 17(2), 67–77. https://doi.org/10.20961/jiep.v17i2.14930

Sugiharti et al., Does human capital spillover affect labor...

- Rahmayani, D., Sugiyanto, F. X., & Kurnia, A. S. (2017). Does human capital spillovers promote economic growth in indonesia? (panel data analysis with gravity's approach). Advanced Science Letters, 23(8), 7114–7117. https://doi.org/10.1166/asl.2017.9304
- Salam, S. A., & Prishardoyo, B. (2018). Pengaruh human capital spillover effects terhadap produktivitas industri pengolahan kawasan Kedungsepur. Economics Development Analysis Journal, 5(2), 226–234. https://doi.org/10.15294/edaj.v5i2.22036
- Schultz, T. W. (1961). Investment in human capital. The American Economic Review, 51(1), 1–17. Retrieved from http://www.jstor.org/stable/1818907
- Sudirman, & Ahmadi. (2014). Pengaruh pendidikan, upah, dan angka harapan hidup terhadap produktivitas tenaga kerja sektor ekonomi di Provinsi Jambi. Jurnal Ilmiah Universitas Batanghari Jambi, 14(4), 65–72. https://doi.org/10.33087/jiubj.v14i4
- Sugiharti, R. R., Islami, F. S., & Pramudiastuti, O. L. (2021). Is educated labor really productive? Economics Development Analysis Journal, 10(1), 43–53.

https://doi.org/10.15294/edaj.v10i1.42530

- Sugiharti, R. R. R. R., Sugiyanto, F., & Kurnia, A. S. A. S. (2017). Does age economy affect productivity?—A survey on sub national of central Java Province. Advanced Science Letters, 23(8), 7146–7149. https://doi.org/10.1166/asl.2017.9312
- Susanti, D. D., Komariyah, S., & Muslihatinningsih, F. (2015). Pengaruh migrasi dan tenaga kerja terhadap PDRB Kabupaten Jember Tahun 2003-2011. E-Journal Ekonomi Bisnis Dan Akuntansi, 2(1), 13–22. https://doi.org/10.19184/ejeba.v2i1.1401.
- Susanto, J., & Welly Udjianto, D. (2019). Human capital spillovers and human development index in Yogyakarta Special Region and Central Java. International Journal of Innovation and Economic Development, 5(2), 57–64. https://doi.org/10.18775/ijied.1849-7551-7020.2015.52.2004
- Todaro, M.P., & Smith, S. C. (2003). Pembangunan Ekonomi di Dunia Ketiga (8. Jilid 2). Jakarta: Erlangga.
- Todaro, Michael P, & Smith, S. C. (2011). Pembangunan Ekonomi (11th ed.; A. Maulana, Ed.). Jakarta: Penerbit Erlangga.

Journal of Socioeconomics and Development, Vol 6, No 1, April 2023

Wooldridge, J. M. (2016). Introductory Econometrics: A Modern Approach. In Tolerance Analysis of Electronic Circuits Using MATHCAD. Boston: Cengage Learing. https://doi.org/10.1201/9781315215402-43

Yuniasih, A. F., Firdaus, M., & Fahmi, I. (2013). Disparitas, konvergensi, dan determinan produktivitas tenaga kerja regional di Indonesia. Jurnal Ekonomi Dan Pembangunan Indonesia, 14(1), 63–81. https://doi.org/10.21002/jepi.v14i1.447

Zheng, S., & Du, R. (2020). How does urban agglomeration integration promote entrepreneurship in China? Evidence from regional human capital spillovers and market integration. Cities, 97(October 2019), 1–16. https://doi.org/10.1016/j.cities.2019.102529