International Journal of Economics, Management and Accounting 23, no. 1 (2015): 37-55

QUALITY OF HUMAN CAPITAL AND LABOR PRODUCTIVITY: A CASE OF MALAYSIA

Mohd Nahar Mohd Arshad[a,b] and Zubaidah Ab Malik[a,c]

[a]*Department of Economics, Kulliyyah of Economics and Management Sciences, International Islamic University Malaysia, Jalan Gombak, 53100 Kuala Lumpur, Malaysia.*
(Email: [b]ma.nahar@iium.edu.my; [c]alfaridah_kias@yahoo.com)

ABSTRACT

In this study, we investigate the impacts of human capital on labor productivity in Malaysia using panel data analysis. Central to the study are the magnitudes of human capital variables, represented by educational levels and health status, on labor productivity. The panel data employed covers 14 states in Malaysia, spanning from 2009 to 2012. Results of the study are estimated using the fixed effects generalized least squares (GLS) model. The results show that human capital quality (higher educational levels and better health status) is positively significant in improving the level of labor productivity in Malaysia. Our estimates also suggest that the impact of health on labor productivity is greater than the impact of education. Improvements in the quality of health and education are therefore crucial for Malaysia to achieve higher productivity growth.

JEL Classification: C33, J24, I130.

Keywords: Human capital, Education, Health, Labor productivity, Panel data analysis

1. INTRODUCTION

Education and health are two crucial aspects in improving human capital quality (Becker, 1964; Schultz, 1961). High quality labor force raises labor productivity. Productivity improvement is achieved when workers with high skills and knowledge, together with sound physical and mental health can perform their tasks with efficiency and effectiveness (Bong, 2009). Highly educated workers are also able to adapt to new technology faster as compared to low educated workers.

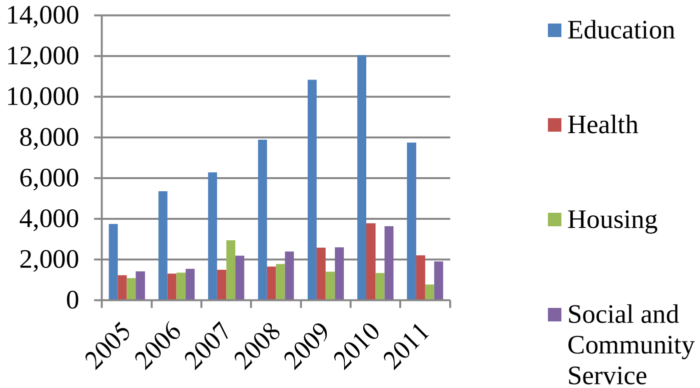
Malaysia, in its efforts to be a developed country by the year 2020, has considered investment in human capital as one of its strategic development areas. The launch of a National Master Plan on Knowledge-economy (K-economy) in 2000 was meant to transform the country's economy from a production-based to a K-economy. Enough supply of skilled and knowledgeable workers is urgently required to support the transformation process. In an effort to improve the standard of higher education in Malaysia, the Ministry of Higher Education (MOHE) in 2007 launched a program called the National Higher Education Action Plan (NHEAP). One important objective of NHEAP is to uplift and ensure the quality and quantity (graduates) of higher education in Malaysia to meet global standard (MOHE, 2007). The Malaysian government commitment to improve its human capital can be seen in the substantial public expenditure, allocated to the education sector, as illustrated in Figure 1; allocation for education is the largest as compared to other expenditure categories. From 2005 to 2010, total expenditure on education had recorded a continuous increase with average growth of 28.9 percent.

Government efforts to improve human capital quality via education is also evident in terms of gross enrollment into higher education. In 1990, tertiary level enrollment was 7.19 percent, increasing to 36 percent in 2012. At the primary and secondary education levels, in 2012, Malaysia has achieved near universal enrollment levels at 96 percent and 82 percent, respectively (Ministry of Education, 2012).

Industries in Malaysia, however, are still lagging in terms of utilizing the available talents. The OECD (2013) reported that in 2010, 74 percent of the Malaysian labor force comprised low-skilled workers (58 percent of the Malaysian labor force had only secondary education, 13.2 percent had primary education and 2.6 percent had no formal education). The situation happened because, over many years, the Malaysian economy had been focusing on low value-added products, hence requiring less skilled workers. The share of skilled workers in the labor force between 2002 and 2007 had declined across all industries while the share of low-skilled workers had increased (National Economic Advisory Council, 2010).

FIGURE 1

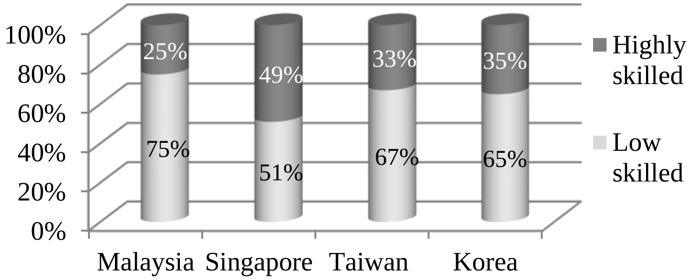
Government Expenditure on Social Services, RM (Million)



Source: Ministry of Finance, Accountant General Department, Bank Negara Malaysia.

In 2007, employment of high skilled workers across all industries was less than 50 percent. Employers were reluctant to pay for skilled workers, instead relying on a pool of cheap low-skilled foreign and local workers. Low-skilled migrant workers contributed more than a third of the increase in total labor supply between 1990 and 2005. As a result, the proportion of highly skilled workers in Malaysia was the lowest, compared to other countries such as Singapore, Taiwan and Korea (refer to Figure 2). In 2007, only 25 percent of the labor force was composed of highly skilled workers (National Economic Advisory Council, 2010).

FIGURE 2
Highly-Skilled and Low-Skilled Labor, (2007)



Source: EPU, World Bank.

The slow adoption of high production technology (and consequently skilled workers) has resulted in a decline in Malaysia's labor productivity (measured by output per worker). As shown in Table 1, before the Asian Financial Crisis of 1997/98, Malaysia was among the highest in terms of labor productivity growth within the Asian countries (in comparison with China, Thailand and Singapore), averaging at 5.5 percent. After the crisis, however, productivity growth declined significantly to 2 percent annually. Weak post-crisis investment and lack of creativity and innovation in the labor market are two possible reasons for the weak productivity growth in Malaysia since the crisis (Maharaja and Zawdie, 2004).

TABLE 1
Average Labor Productivity Growth of Selected Asian Countries, (1987-2007; percent)

	Pre-Crisis (1987-1997)	Post Crisis (1998-2007)
China	4.5	5.5
Malaysia	5.5	2.9
Thailand	5.2	3.1
Indonesia	3.1	3.0
Singapore	4.5	2.4
Philippines	–0.7	2.3

Source: EPU, Malaysia and World Bank.

The observed Malaysian labor market conditions have raised one pertinent question: does quality of human capital matter to labor productivity in Malaysia? This study, therefore, has the principal objective of estimating the contributions of human capital quality to labor productivity in Malaysia. We consider worker educational level and health status as proxies for human capital quality. This study is unique because the measure of human capital quality takes into account both education and health components and it is also based on an updated panel dataset of Malaysia. Most previous studies based on Malaysia however, had considered the educational aspect only as a measure of human capital quality. The following section gives the literature review on human capital quality and productivity. Section 3 presents the model specifications that relate productivity with capital, labor quantity and labor quality. Section 4 discusses the data and methodological approach employed for the estimations. Section 5 analyzes the results, while Section 6 gives the conclusion and some policy recommendations.

2. LITERATURE REVIEW

In general, studies on the effects of human capital quality on productivity can be divided into a single country or a cross-country analyses (macro level). Some of the recent studies such as Chansarn (2010), Afrooz et al. (2010) and Jajri and Ismail (2010) have identified human capital in terms of education only while studies by Bloom, Canning and Sevilla (2003), Rivera and Currais (2013) and Umoru and Yaqub (2013) included health aspects as well in measuring the magnitude of human capital influence on labor productivity. Studies using firm level data (micro level) to understand the relationship often exclude the health variables since obtaining workers' health information is not as easy as obtaining their educational information. In macro level analysis, both education and health variables are usually included as proxies for human capital quality.

Variables commonly used as proxies for education are mean years of schooling, educational level, school enrollment rate, government expenditure on education and literacy rate. Health variables are measured by life expectancy, government expenditure on health and adult survival rate. Most studies reveal that education and health contribute positively to labor productivity. Although many studies have investigated the subject, studies based on Malaysia are rather limited. Two mostly quoted studies based on Malaysia were by Ismail and Jajri (2007) and Jajri and Ismail (2010).

According to Forbes et al. (2010) the positive relationship between education level and labor productivity exists because education leads to the accumulation of skills that make workers more systematic and dynamic in performing their chores, thus leading to productivity. The skills, they argued, can be either job specific or broad skills; both are relevant in improving productivity.

A cross-country study by Belorgey, Lecat and Maury (2006) had investigated determinants of labor productivity using year 2000 dataset. They focused on the role of human capital, public infrastructure, financial development, information and communications technology (ICT) spending and unemployment rate for two samples of countries and applied the Generalized Method of Moments (GMM) method in their estimations. This method allows certain determinants to have a diffusion effect on productivity. This method was used in cases where the number of estimating equation-moment conditions exceed the number of unknown parameters to be estimated. The first sample consisted of 77 countries and the second sample involved 49 mostly-developed countries. Belorgey, Lecat and Maury (2006) found that human capital (measured by gross school enrollment in primary and tertiary education) was positively significant as a determinant of labor productivity in both samples.

Chansarn (2010), using multiple regression analysis, noted a positive relationship between the effects of education and labor productivity The study used panel data of 30 Western countries covering a 24 year period. Results from the Ordinary Least Square (OLS) estimation showed that mean years of schooling was statistically significant in explaining labor productivity where a one year increase in mean years of schooling results in labor productivity annual growth rate increase of 0.208 percent, *ceteris paribus*.

Studies on how human capital quality affects labor productivity based on a single country case are mostly conducted using firm or industry level data. Jajri and Ismail (2007), for instance, investigated the effects of human capital in terms of education on output and labor productivity of firms in Malaysia based on the Cobb-Douglas production function. The data were gathered from 574 firms in Malaysia surveyed in 2001 and 2002. They analyzed the effects of education (mean years of schooling) on labor productivity by running two OLS estimations. The first estimation was between overall manufacturing and service sectors while the second estimation was between types of manufacturing and service sectors. Their findings show that education had a significantly positive effect on labor productivity only in some industries. Secondary education qualification was found to contribute positively to labor productivity only in the textile industry. They also found that in metal products, electrical and electronics and food industries, the growth of labor productivity was marginal due to large contribution from the growth of capital-intensive production (Ismail and Jajri, 2007). Their study also found that in the service industry, variables such as mean years of schooling and workers with primary, secondary and tertiary education were statistically significant in explaining labor productivity.

In another industry-level study, Afrooz et al. (2010) estimated the effects of human capital on labor productivity in the food industry of Iran based on the Cobb Douglas production function. The authors employed panel data of 22 food manufacturing firms over the 1995 to 2006 periods. Based on the estimation of two way error components of fixed effect model, educated and skilled workers (as proxies for human capital) were found to have significant effects on labor productivity. The coefficients indicated that when the ratios of educated workers to uneducated workers and skilled workers to unskilled workers increased by one percent, value added per worker in Iran's food industry would increase by 0.14 and 0.41 percent, respectively (Afrooz et al., 2010).

Qu and Cai (2011) estimated the effect of education and training on labor productivity in China by using cross sectional industry data. Human capital variable was measured by workers' different educational levels. They found a positive relationship between workers' educational level and labor productivity in the manufacturing industry. Productivity growth of workers with junior and senior high school education were found to be lower than in those with college or university qualifications. The results also show that workers with graduate school qualification had a lower productivity growth than those with college qualification. The reason was that workers with master's degree or higher might not influence production processes for manufacturing firms directly. Most of them were involved in management related jobs. Manufacturing workers were mainly senior high school and college graduates.

Fleisher et al. (2011) investigated the effects of education on labor productivity in China, using panel data of 425 firms from 1998 to 2000. Their reported results were based on Fixed Effects (FE) estimation. One advantage of the FE model was that the problem of unobserved firm-specific effects could be eliminated (assuming that these unobserved effects were fixed over time). In order to control for time-varying firm-specific productivity shocks, they considered intermediate goods as a proxy variable. They found a positive relationship between mean years of schooling and labor productivity, in particular, for highly educated workers, where the marginal products and wages of highly educated workers were higher than that of less educated workers.

Health is another vital component of human capital influencing worker productivity level. Good health is associated with reduced worker incapacity and debility, lower days off work due to illness, higher motivation level, and as a consequence, leads to higher productivity over the life cycle (Rivera and Currais, 2003). Good health, therefore, has positive effects on wages and retirement benefit packages (Ghatak, 2010). In addition, healthier workers are more productive and earn higher wages because they are physically and mentally more energetic and robust to job challenges and conditions (Bloom, Canning and Sevilla , 2003).

Bloom, Canning and Sevilla (2003) analyzed the effects of both education and health on labor productivity (output per worker) using panel data of 104 countries, observed every 10 years from 1960 to 1990. Life expectancy was a health variable in their Cobb-Douglas production function specifications. They found that education and health variables were highly correlated. This high correlation had been the main reason for many studies excluding the health variable in their estimations due to the multicolinearity problem. Once the problem was addressed, Bloom and colleagues found positively significant effect of health on productivity.

In a study based on time-series data, Umoru and Yaqub (2013) investigated the effect of education and health on labor productivity in Nigeria. Based on the Generalized Method of Moments (GMM) method of estimation, they found that life expectancy and secondary school enrollment rate were positively significant variables affecting output per worker. An increase in one additional year of life expectancy increased output per worker by 0.06 percent. However, another human capital variable, namely, government investment in education, had no significant effects (the sign was negative) on output per worker. Rivera and Currais (2013), on the other hand, employed a cross-country data and also found positive effects of education and health on productivity—coefficients for years of schooling and public expenditure on health were 0.25 percent and 0.18 percent, respectively.

A study on the effect of education and health on labor productivity in Australia by Forbes et al. (2010) employed data from the Household, Income and Labor Dynamics in Australia (HILDA) survey. They applied the Heckman approach to address the issue of sample selection bias; their findings revealed that increased educational attainment had a significant positive effect on hourly wage. A male worker with a degree qualification had higher hourly wage by almost 24 percent than one with diploma qualification, *ceteris paribus*. They also measured effects of five health problems on hourly wage and all those health problems significantly resulted in the reduction of hourly wage.

Empirical evidence on the impact of human capital quality on labor productivity, in general, is positive despite differences in model specification, time frames, sample selection, measurement problems and variables used. Mean years of schooling and school gross enrollment were the two most common measurements of education used when researchers examined the role of human capital on labor productivity through single or cross country study. On the other hand, firm level analyses, such as by Jajri and Ismail (2010) and Ismail and Jajri (2007), only focused on education variables to proxy human capital, excluding health variables because of difficulty in obtaining data. Based on panel data analysis, this study investigates the effects of human capital quality on labor productivity in Malaysia by considering both education and health variables. Discussion on model specifications employed in this study follows in the next section.

3. MODEL SPECIFICATIONS

In a simple production function, output is produced with the combination of physical capital (K) and labor input (L). Quantity of labor may represent the measure of labor input but this simplification relies upon the assumption that labor is homogeneous. This measurement also ignores the importance of human capital acquired through education, training and skill. Studies by Lucas (1988) and Romer (1989) for example, have shown that human capital quality has a direct effect on labor productivity. Taking into account the quality of labor input is therefore essential to ensure unbiased estimates of labor productivity.

In order to estimate human capital effects on labor productivity, we employ a Cobb-Douglas production function in this study. This functional form is flexible and results obtained can be interpreted in a straightforward manner. The functional form also has commonly been employed in many previous studies such as Afrooz et al. (2010), Jajri and Ismail (2010) and Bloom, Canning and Sevilla (2003). A simple Cobb-Douglas production function can be expressed as:

$$(1) \qquad Y_t = AK_t^{\alpha}L_t^{\beta}$$

where Y refers to the output, K is physical capital stock, L is quantity of labor assumed to be homogeneous, $\alpha + \beta = 1$ for constant return to scale assumption, A is the efficiency parameter and t is time trend. Lucas (1988) however, argues that labor is different based on his accumulated human capital. A production function that takes into account the quality of labor, therefore, can be written as:

$$(2) \qquad Y_t = AK_t^{\alpha}(uhL)_t^{\beta}$$

where u is time allocated for producing output, $(1 - u)$ denotes time allocated for human capital investment, h is human capital stock.

The term $uhL = L^*$, constitutes effective labor. Production function based on effective labor can thus be written as:

(3) $$Y_t = AK_t^\alpha (L_t^*)^\beta$$

In order to analyze how accumulated human capital is related to the production function, effective labor, L^* refers to the labor with three levels of education and healthy mental and physical conditions, or simply expressed as:

(4) $$L_t^* = L_t^{\theta_j} L_t^\gamma,\ j = 1, 2, \text{and } 3$$

where $L_t^{\theta_j}$ is the proportion of labor with different jth level of education (j = 1, 2 and 3), where 1 = primary, 2 = secondary, and 3 = tertiary level at t time and L_t^γ is the proportion of labor with good health status at t time period. By substituting (4) into (2), we obtain:

(5) $$Y_t = AK_t^\alpha (L_t^{\theta_1} L_t^{\theta_2} L_t^{\theta_3} L_t^\gamma)^\beta$$

In order to derive the labor productivity function, both sides of (5) are divided by L_t, and expressed as:

(6) $$\frac{Y_t}{L_t} = \frac{AK_t^\alpha (L_t^{\theta_1} L_t^{\theta_2} L_t^{\theta_3} L_t^\gamma)^\beta}{L_t}$$

Equation (6) can be re-written as:

(7) $$\frac{Y_t}{L_t} = A\left(\frac{K_t}{L_t}\right)^\alpha L_t^{\beta\theta_1} L_t^{\beta\theta_2} L_t^{\beta\theta_3} L_t^{\beta\gamma}$$

Basically, (7) relates labor productivity to the capital-labor ratio and proportion of labor with primary, secondary and tertiary qualifications, as well as labor with good health status at certain period t.

From (7), the panel estimation model for this study is derived by taking a log form to both sides of the equation. Our estimation model is written as:

$$(8) \quad \ln(GDP_{it}/L_{it}) = \beta_0 + \beta_1 \ln(K_{it}/L_{it}) + \beta_2 \ln(L_{it}) + \beta_3 \ln(PE_{it}) + \beta_4 \ln(SE_{it}) + \beta_5 \ln(TE_{it}) + \beta_6 \ln(H_{it}) + e_{it}$$

where GDP/L is Gross Domestic Product (GDP) per worker; K/L is gross fixed capital formation per worker; L is number of employed workers; PE is number of workers with primary education; SE is number of workers with secondary education; TE is number of workers with tertiary education; H is life expectancy and e is the error term. The subscript i represents the number of states ($i = 1, 2, \dots, N$) and t represents the number of years ($t = 1, 2, \dots, T$).

Except for the variable number of employed workers (L), other variables are expected to have positive relationships with GDP per worker. The number of employed workers is expected to have a negative sign due to law of diminishing marginal returns. Given a panel dataset at hand, Hausman test is applied in order to identify whether the Fixed Effects (FE) or Random Effects (RE) model is appropriate for the estimation. Further discussions on the dataset and estimation methodology employed in the study are provided in the next section.

4. DATA AND METHODOLOGY

This study involves panel data where the data are collected from reports published by the Department of Statistic (DoS) Malaysia and Malaysian Investment Development Authority. The cross-section part of the panel consists of 14 (N =14) states in Malaysia, including Federal Territory of Kuala Lumpur and the time-series part of the panel involves years 2009, 2010, 2011 to 2012 (T = 4). For the study, there are 56 total observations (N x T = 56).

To estimate (8), we obtain data on value of GDP in Ringgit Malaysia (RM) at constant 2005 prices to measure output, total number of labor, value of gross fixed capital formation (RM), number of labor with primary, secondary and tertiary education and life expectancy for each of the 14 states in Malaysia. Choice of variables employed to estimate (8) is based on availability and completeness of data to represent all the 14 states. Since data on life expectancy for each state prior to 2009 are incomplete, the time-series part of the panel begins from 2009 to the latest year 2012 of complete record of data available. Statistical descriptions of the variables employed in the study are shown in Table 3.

TABLE 3
Statistical Descriptions of the Data

Variable	Average (2009-2012) values			
	Mean	Std. Dev.	Min	Max
Labor productivity (million) (*GDP/L*)	53.82	25.71	22.45	138.50
Primary qualification (thousand) (*PE*)	147.93	111.18	11.30	454.20
Secondary qualification (thousand) (*SE*)	470.41	316.39	47.60	1437.60
Tertiary qualification (thousand) (*TE*)	202.07	203.07	18.50	985.60
Life expectancy (years) (*H*)	73.92	1.67	70.50	77.80
Variable	**Mean values by year**			
	2009	2010	2011	2012
Labor productivity (million) (*GDP/L*)	53.15	52.71	54.13	55.28
Primary qualification (thousand) (*PE*)	136.87	151.42	149.49	153.94
Secondary qualification (thousand) (*SE*)	427.77	466.28	483.98	503.59
Tertiary qualification (thousand) (*TE*)	180.95	198.48	210.91	217.94
Life expectancy (years) (*H*)	73.56	73.80	74.05	74.27

As shown in Table 3, the third to the sixth columns describe the mean, standard deviation, minimum and maximum values for all variables within the four years of the study period while the last four columns show only the mean values by year for each variable. The average labor productivity in Malaysia for the study period was RM53.815 million. Year 2010 recorded the lowest productivity at RM52.796 million but productivity slowly rose since then with the highest level recorded in 2012 at RM55.276 million. The decline in productivity level from 2009 to 2010 could be due to the global financial crisis that had affected Malaysia to a certain degree.

In terms of educational qualification, secondary educated workers (*SE*) dominated the labor market in Malaysia with an average of 470 thousand workers from 2009 to 2012 as compared to only 148 thousand workers with primary education (*PE*) and 202 thousand workers with tertiary education (*TE*). This labor force composition suited the manufacturing-based nature of the Malaysian economy. Productivity level was mainly driven by technological advancement in production processes. Note also that over the study period, standard deviation of *SE* was also the highest as compared to other educational levels. It indicates wider gap across states in terms of labor composition with secondary education.

Both educational and health variables in Table 3 (the last four columns) also show increasing trends from 2009 to 2012. For example, on average, the number of tertiary educated employees in 2009 was 180,950, rising to 198,479 in 2010 and continued increasing in 2011 to 210,907 before reaching 217,943 in 2012. Average life expectancy also had increased continuously every year from 2009 to 2012, reflecting an improved health status among Malaysians. Whether these educational and health variables significantly explain labor productivity in Malaysia is answered in the next section.

5. EMPIRICAL RESULTS AND DISCUSSION

Results in Table 4 are obtained by estimating (8) using Fixed Effects (FE) Generalized Least Square (GLS) estimation procedure. GLS procedure was employed in order to overcome the problem of heteroskedasticity and autocorrelation as detected in the data. The chi-square (χ^2) value for a modified Wald statistic for groupwise heteroskedasticity in the residuals of a fixed effect regression model (Greene, 2000) was 2449.36 (prob > chi-square = 0.00), indicating the presence of heteroskedasticity. To test for serial-correlation, a Lagrange-Multiplier test was conducted. The corresponding *F*-statistic was 19.55 (prob > F = 0.00), suggesting a serial correlation issue. Furthermore, Hausman test conducted points to the appropriateness of FE model. The null hypothesis that there were no systematic difference (similarities) between the estimators was rejected at the chi-square (χ^2) value of –43.79, suggesting that the FE model is the appropriate model (consistent coefficient estimates).

Equation (8) has been estimated to describe labor productivity in Malaysia. As shown in Table 4, labor productivity in Malaysia is explained by growth in number of workers and quality of human capital (education and health). Growth in capital-labor ratio [ln (K/L)] and workers with primary education [ln (*PE*)], however, were statistically insignificant. Perhaps, capital and labor in Malaysia are generally substitute inputs for the overall economy. As the country moves away from labor-intensive production to a more capital-intensive production, quality of labor matters as compared to quantity. Only when the overall structure of the economy is technological based, may the capital-labor ratio turn significant. This claim is supported by Jajri and Ismail (2010) and Ismail and Jajri (2007). Their studies based on Malaysia had found no significant effects of capital-labor ratio on labor productivity. According to them, labor productivity for the large scale manufacturing firms (technological based) in Malaysia was explained by efficiency in production process (achieved by technological progress) and human capital improvement (as we claim above). They indicated that productivity gains via efficiency for large scale firms in Malaysia was significantly higher than the contribution of capital-labor ratio by 60 percent as compared to sectors such as agriculture and construction.

TABLE 4
Estimation Results: ln (*GDP*/*L*) as the Dependent Variable

Variables	Coefficient
Constant	-52.041*
	(8.743)
ln(*K*/*L*)	0.036
	(0.034)
ln(*L*)	-4.334**
	(2.232)
ln(*PE*)	0.594
	(0.633)
ln(SE)	1.861*
	(1.030)
ln(*TE*)	1.694***
	(0.638)
ln(*H*)	14.304***
	(2.424)
Log likelihood	3.414253
Wald chi-square (*df* = 6)	132.64
Prob > chi-square	0.0000

Note: *** Significant at 1%, ** significant at 5% and * significant at 10%. Figures in parentheses are standard errors.

Based on the results in Table 4, there is a significant negative effect of growth in the labor supply, ln (*L*), on productivity at the 5 percent level of significance. Our estimation shows that a one percent increase in labor supply results in a productivity decline by 4.33 percent, *ceteris paribus*. Fairly constant increase in capital formation and much faster increase in number of workers may result in diminishing returns in the supply-side economy of Malaysia. Influx of low-skilled foreign workers is another possible explanation for the negative relationship. One-third of the increase in total labor supply during the study period comes from foreign workers and more than 95 percent of the cohort were semi and low-skilled migrant workers.

Further effects of education on labor productivity in Malaysia are now discussed based on the variables natural log of worker with primary [ln(*PE*)], secondary [ln(*SE*)] and tertiary [ln(*TE*)] levels of education. The results show that only ln(*SE*) and ln(*TE*) are statistically significant with the expected positive effects on labor productivity in Malaysia. As shown in Table 4, an increase of one percent in the number of workers with secondary and tertiary qualifications will result in labor productivity gains by 1.86 percent and 1.69 percent, respectively. The importance of better quality of human capital as a source of productivity improvement, achieved by better educational qualifications, is once again demonstrated in this study; Jajri and Ismail (2010) and Ismail and Jajri (2007) also had arrived at the same conclusion.

Still on the effects of education, the magnitude of ln(*SE*) however is significantly higher than the effects of ln(*TE*), as presented in Table 4. One reason for this trend is that the Malaysian economy remains a middle-income economy, driven broadly by manufacturing, construction and mining sectors. These sectors primarily rely on workers with secondary education to handle machines and less complex technical chores. An adoption of advanced technology could simply increase productivity. Even though 54.5 percent of Malaysia's Gross Domestic Product (GDP) in 2012 was contributed by the services sector, the sector was mainly a supporting sector to the economy. Besides that, lower magnitude of ln (*TE*) might be due to the issues of graduate incompetency—mismatched between skills needed by the industries and those acquired by graduates. More than 40 percent of firms in Malaysia reported that job applicants with tertiary qualification lacked the required skill to fulfill the job vacancies (OECD, 2013. A Ministry of Higher Education survey in 2008 (MOE, 2012) showed that almost 25 percent of graduates remained unemployed for six months; while for those who found jobs, almost one-third were in low skilled jobs (OECD, 2013).

The results in Table 4 also show that health variable, ln(*H*), is positively significant at the one percent level of significance in explaining labor productivity in Malaysia. An increase in life expectancy by one percent will increase labor productivity by 14 percent, *ceteris paribus*. As compared to education, health variable is the main component of human capital that contributes mostly to labor productivity in Malaysia. A study by Bloom, Canning and Sevilla (2003), for example, also found a positive and significant relationship between health (measured by life expectancy) and labor productivity. According to them, healthier workers are mentally and physically more energetic, more productive, earned higher wages and are also less likely to be absent from work due to illness, thus contributing significantly to productivity.

Our findings show that better educational qualifications and health contribute significantly to labor productivity in Malaysia. Growth in workers with secondary education has much higher effects on productivity than workers with tertiary education since the Malaysian economy is dominated by the manufacturing, construction and mining sectors. This study also found that life expectancy improvement has the highest effect on labor productivity in Malaysia. Some recommendations and concluding remarks follow in the next section.

6. RECOMMENDATIONS AND CONCLUSION

In this study, we investigate the effects of human capital quality, in term of educational attainment and health, on labor productivity in Malaysia. Based on the latest data available, panel data analyses have been undertaken. From the reported FE model, we found significant effects of human capital quality on Malaysia's labor productivity. For Malaysia to advance, efforts to improve its human capital quality should continue to be a priority. Government expenditure on education should be utilized efficiently to ensure the education provided meets national requirements.

To improve labor productivity, an immediate policy the government should consider is to control the influx of low-skilled foreign workers into Malaysia. Recall that a negative relationship between growth in the number of labor, ln(*L*), on productivity has been found in this study—a one percent increase in labor supply results in a productivity decline by 4.33 percent, *ceteris paribus*. Since one-third of the increase in total labor supply during the study period comes from foreign workers with more than 95 percent of them semi and low-skilled migrant labor, reducing Malaysia's reliance on this group of labor, while at the same time substituting them with capital, may improve labor productivity.

Moving into a capital-intensive economy means Malaysia needs to adopt more advanced technologies to increase its GDP. This study shows that labor productivity in Malaysia has been mainly explained by the contribution of secondary educated workers. The contributions of tertiary qualified workers to labor productivity, however, is significantly lower. Adoption of more advanced technology may improve the contribution of workers with tertiary qualification. At the same time, efforts to improve labor productivity in Malaysia should also address the issue of graduate incompetency or mismatch between skills needed by industry and those acquired by graduates. More than 40 percent of firms in Malaysia reported that job applicants with tertiary qualification lacked the required skills to fulfill the job vacancies (OECD, 2013). In another survey, it was found that almost 25 percent of graduates remained unemployed for six months while almost one-third of those who found jobs were in low skilled employment (MOE, 2012). Reducing the mismatch gap, therefore, should be another concern in any labor productivity improvement effort.

Finally, the health care system also should be geared toward improving life expectancy. Apart from that, a scheme also should be devised to encourage firms and offices to promote a healthy lifestyle among workers. With better health, life expectancy could be prolonged. Healthier workers have higher productivity since they are mentally and physically more energetic and less likely to take medical leave.

REFERENCES

Afrooz, Ahmad, Khalid Abdul Rahim, Zaleha Mohd Noor, and Lee Chin. "Human Capital and Labor Productivity in Food Industries of Iran." *International Journal of Economics and Finance* (2010): 47-51.

Aggrey, Niringiye, Luvanda Eliab, and Shitundu Joseph. "Human Capital and Labor Productivity in East African Manufacturing Firms." *Current Research Journal of Economic Theory* (2010): 48-54.

Becker, Gary S. *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education.* New York:

National Bureau of Economic Research, Columbia University Press, 1964.

Belorgey, Nicolas, Rémy Lecat and Tristan-Pierre Maury. "Determinants of Productivity per Employee: An Empirical Estimation Using Panel Data." *Economics Letters 91* (2006): 153-57.

Bloom, David E, David Canning, and Jaypee Sevilla. "The Effect of Health on Economic Growth: A Production Function Approach." *World Development* (2003): 1-13.

Bong, Kwon Dae. "Human Capital and its Measurements." *OECD World Forum.* Busan: OECD World Forum (2009): 1-15.

Chansarn, Supachet . "Labor Productivity Growth, Education, Health and Technological Progress: A Cross-Country Analysis." *Economic Analysis & Policy* (2010): 249-61.

Fleisher, Belton M, Yifan Hu, Haizheng Li, and Seonghoon Kim. "Economic Transition, Higher Education and Worker Productivity in China." *Journal of Development Economics* (2011): 86-94.

Forbes, Matthew, Andrew, Barke, and Stewart, Turner. "The Effects of Education and Health on Wages and Productivity." *Productivity Commission Staff Working Paper* (2010): 1-96.

Ghatak, Amrita. "Health, Labour Supply and Wages: A Critical Review of Literature." *Working Paper Series* (2010): 1-26.

Greene, W. Econometric Analysis. Upper Saddle River, NJ: Prentice Hall, 2000.

Ismail, Rahmah, and Idris Jajri. "Sources of Labour Productivity Growth in Large Scale Industries in Malaysia." *Jurnal Ekonomi Malaysia* (2007): 59-75.

Jajri, Idris, and Rahmah Ismail. "Impact of Labour Quality on Labour Productivity and Economic Growth." *African Journal of Business Management* (2010): 486-95.

Maharaja, Chandra, and Girma Zawdie. "The 'Black Box Syndrome in Technology Transfer and the Challenge of Innovation in Developing Countries. The Case of International Joint Ventures in Malaysia." *International Journal of Technology Management & Sustainable Development* 3 (2004): 233-52.

MOHE, Ministry of Higher Education. *National Higher Education Action Plan 2007 - 2010*. Ministry of Higher Education Malaysia, 2007.

MOE, Ministry of Education. *Quick Facts 2012 Malaysia Educational Statistics*. Edited by Educational Planning and Research Division: Ministry of Education Malaysia, 2012.

National Economic Advisory Council. *New Economic Model for Malaysia, Part 1.* Malaysia: Percetakan National Berhad, 2010.

OECD. *Southeast Asian Economic Outlook 2013: Structural Policy Country Notes, Malaysia.* France: OECD, 2013.

Pelkowski, Jodi Messer, and Mark C. Berger. "The Impact of Health on Employment, Wages and Hours Worked Over the Life Cycle." *The Quarterly Review of Economics and Finance* (2004): 102-21.

Qu, Yue, and Fang Cai. "Understanding China's Workforce Competitiveness: A Macro Analysis." *Journal of Chinese Human Resource Management* 2 (2011): 8-22.

Rivera, Berta, and Luis Currais. "The Effect of Health Investment on Growth: A Causality Analysis." *International Advances in Economic Research* (2003): 312-24.

Schultz, Theodore W. "Investment in Human Capital." *The American Economic Review* (1961): 1-17.

Umoru, David, and Jameelah Omolara Yaqub. "Labour Productivity and Health Capital in Nigeria: The Empirical Evidence." *International Journal of Humanities and Social Science* (2013): 199-221.