Does Education Raise Productivity and Wages Equally?

Vehtasvili

Abstract: This paper estimates the effects of education on productivity and wages in Indonesia in comparison to other countries studied by Hellerstein et al. (1999a, 1999b), van Ours and Stoeldraijer (2011), and Kampelmann et al. (2018). This research utilizes labor wage data based on educational categories from the Central Bureau of Statistics of Indonesia. The educational categories were divided by the sixth level of education; elementary school/below, junior high school, senior high school, vocational high school, vocational schools I/II/III, and university. The results indicate the effects of education on productivity and wages vary across educational categories, job field categories, and by gender. Male university-level graduate workers earn higher average wages as compared to female university-level graduate workers, supporting the existence of a glass ceiling in female career development in Indonesia, Belgium, and Israel. However, male workers were found to be more dominant in Indonesia than in Belgium and Israel, which could be attributed to cultural and religious factors such as the Muslim way of life and Indonesian tradition, which support the ideal that men, not women, should work and be the family’s providers.

Keywords: education, productivity, labor wage, gender, culture

1. Introduction

Human capital increases with the knowledge, skills, and health that people accumulate in their lifetime. It enables them to realize their potential as productive members of society and has large payoffs for individuals, societies, and countries. In the 1700s, Scottish economist Adam Smith stated that, “The acquisition of talents during education, study, or apprenticeship costs a real expense, which is capital in a person.” These talents become part of his fortune as well as a society (Smith, 1937).

The theory of human capital proposes that education develops skills that enable workers to be more productive, and wage differentials reflect differences in productivity (Becker, 1964). More highly-educated workers would earn higher wages ceteris paribus simply because they are more productive than their less-educated counterparts. This explanation of pay inequality has been studied by empirical and theoretical work on labor markets.

Economists have studied explanations of differences between productivity and wages, without abandoning the assumptions of individual rationality and profit-maximizing firms. Productivity-wage differences represent the logical approach of companies to tackle a variety of market anomalies (Lazear and Shaw, 2007). Poorly educated workers are not very costly to their marginal products in general based on alternative theories such as tournament (Lazear and Rosen, 1981), internal organizational decision-making, monopsony, and monitoring issues (Bebchuk and Fried, 2003; Osterman et al., 2009). The goal of most policies is to increase the employability of poorly educated people in the Organisation for Economic Co-operation and Development (OECD) areas to foster...
Does Education Raise Productivity and Wages Equally?

the latter’s productivity (e.g., training programs) and decrease their wage cost (e.g., through reduced payroll taxes).

This paper estimates the effects of education on productivity and wages in Indonesia to compare them to other countries studied by Hellerstein et al. (1999a, 1999b), van Ours and Stoeldraijer (2011), and Kampelmann et al. (2018). Israeli society is structured to discriminate against women in other aspects of the economy, such as responsibility for home production, which may render them less productive in the workforce (Hellerstein et al., 1999a, 1999b). We find that women are paid significantly less than men, with the wage differential between men and women generally much larger than the productivity differential (van Ours and Stoeldraijer, 2011). The level of women’s education in Belgium has a significantly stronger positive effect on their productivity than on their wage cost. Highly educated women were found to be relatively underpaid as compared to less educated women. On the other hand, for male workers, education-driven productivity gains are not deviating significantly from wage cost differentials. The existence of a wage-compression effect partially supported by predictions of the human capital theory has been observed (Kampelmann et al., 2018).

This research is a unique theoretical model approach with estimation using data from the Central Bureau of Statistics of Indonesia that has seldom been explored. It applies labor wage data based on educational categories, job field categories, and gender.

2. Methodology

2.1. Data and measures

The data were sourced from a data set constructed by the Central Bureau of Statistics of Indonesia (BPS) for the period 2018-2019 (BPS-Statistics, 2018, 2019) as listed in Table 1. The Laborer Situation in Indonesia presents data from the National Labor Force Survey (NLFS) conducted by BPS-Statistics Indonesia in every semester in one year, in February and August. This data of laborers in Indonesia was separated into two main groups-laborers (employees, informal workers in agriculture, and informal workers in non-agriculture), and employees. The first semester of NLFS covered 34 provinces in Indonesia with a sample of 75,000 households and a 99.19% response rate. The data were further classified by gender (male and female) and location (urban-rural classification). The publication of NLFS presents data on industries that group into 17 job field categories. For simply study, the seventeen job field categories symbolized by the letter A until Q.

Net wage or salary per month refers to the wage received by employees in the previous month from primary jobs and consists of basic wages and allowances in terms of money or goods paid by the employer (BPS-Statistics, 2018, 2019). Basic wage is wage received by the employee who is fixed by mutual agreement, national laws, or regulations, and paid in virtue of a written or unwritten contract of employment by the employer to the employee. Allowances are allowances associated with jobs-not entitled workers-such as performance allowances, positional allowances, and cost of living (money or goods). Wage rates exclude overtime payments, bonuses and gratuities, family allowances, and other social security payments made by employers. Ex gratia payments in kind, supplementary to standard wage rates, overtime payments, meal allowances, transportation allowances,
holiday allowances, family allowances, bonuses and gratuities, etc., are excluded.

2.2. Estimation

The model is the estimation of a value-added function and the wage cost equation at the firm level. The value-added function generates parameter estimates for the average impact of workers with different educational levels, whereas wage equation estimates the relative effect of each educational category on the average wage bill paid by the firm. Both equations of the estimation use an identical set of firms, educational categories, and covariates, parameters for output elasticities, and wages can stack up to conclusions on educational productivity-wage gaps that can be drawn. The technique, pioneered by Hellerstein et al. (1999a, 1999b) and refined by van Ours and Stoeldraijer (2011), Kampelmann et al. (2018), among others (Rycx et al., 2015), become a guideline on the productivity and wage effects of labor heterogeneity literature (Ilmakunnas and Maliranta., 2005; Garnero et al., 2014; Nielen and Schiersch, 2014; Devicienti et al., 2017; Giuliano et al., 2017).

Table 1. Average labor wages per year by primary employment in 17 job field categories and gender (IDR million)

<table>
<thead>
<tr>
<th>No</th>
<th>Job Field Categories</th>
<th>Symbol</th>
<th>Average Wage (IDR million)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Men</td>
</tr>
<tr>
<td>1</td>
<td>Agriculture, forestry, and fishing</td>
<td>A</td>
<td>2.05</td>
</tr>
<tr>
<td>2</td>
<td>Mining and quarrying</td>
<td>B</td>
<td>4.65</td>
</tr>
<tr>
<td>3</td>
<td>Manufacturing</td>
<td>C</td>
<td>2.86</td>
</tr>
<tr>
<td>4</td>
<td>Electricity and gas supply</td>
<td>D</td>
<td>3.60</td>
</tr>
<tr>
<td>5</td>
<td>Water supply, sewerage, waste management, and remediation activities</td>
<td>E</td>
<td>2.92</td>
</tr>
<tr>
<td>6</td>
<td>Construction</td>
<td>F</td>
<td>2.71</td>
</tr>
<tr>
<td>7</td>
<td>Wholesale and retail trade, repair of vehicles and motorcycles</td>
<td>G</td>
<td>2.39</td>
</tr>
<tr>
<td>8</td>
<td>Transportation and storage</td>
<td>H</td>
<td>3.25</td>
</tr>
<tr>
<td>9</td>
<td>Accommodation and food services</td>
<td>I</td>
<td>2.52</td>
</tr>
<tr>
<td>10</td>
<td>Information and communication</td>
<td>J</td>
<td>4.20</td>
</tr>
<tr>
<td>11</td>
<td>Financial and insurance activities</td>
<td>K</td>
<td>4.17</td>
</tr>
<tr>
<td>12</td>
<td>Real estate activities</td>
<td>L</td>
<td>3.16</td>
</tr>
<tr>
<td>13</td>
<td>Business activities</td>
<td>M</td>
<td>3.18</td>
</tr>
<tr>
<td>14</td>
<td>Public administration and defense, compulsory social security</td>
<td>N</td>
<td>4.00</td>
</tr>
<tr>
<td>15</td>
<td>Education</td>
<td>O</td>
<td>3.01</td>
</tr>
<tr>
<td>16</td>
<td>Human health and social work activities</td>
<td>P</td>
<td>3.49</td>
</tr>
<tr>
<td>17</td>
<td>Other services activities</td>
<td>Q</td>
<td>2.17</td>
</tr>
</tbody>
</table>
Does Education Raise Productivity and Wages Equally? (Vebtasvili)

Firm-level productivity and wage cost equations estimation are as follows:

\[
\ln \left( \frac{\text{Value Added}}{\text{Hours}} \right)_{it} = \alpha + \sum_{j=1}^{J} \beta_j \text{Education}_{j,it} + \lambda X_{it} + \epsilon_{it} \quad (1)
\]

\[
\ln \left( \frac{\text{Wage Cost}}{\text{Hours}} \right)_{it} = \alpha^* + \sum_{j=1}^{J} \beta_j^* \text{Education}_{j,it} + \lambda^* X_{it} + \epsilon^*_{it} \quad (2)
\]

The dependent variable is firm \(i\)'s hourly valued added in Equation (1), obtained by dividing the total value added by firm \(i\) in period \(t\) by the total number of hours worked (taking into account paid overtime hours). The dependent variable in Equation (2) is firm \(i\)'s average wage bill (including payroll taxes and variable pay components for, e.g., overtime, weekend or night work, performance bonuses, and commissions). It is attained by dividing the total wage cost of the firm by the total hours worked.

The independent variables are shares in total work hours by each educational category in total hours worked. \text{Education}_{j,i,t}, is a better indicator of employment than the number of employees in each category, taking into account educational differences in working time. The sixth educational categories are elementary school/below, junior high school, senior high school, vocational high school, vocational schools I/II/III, and university.

The shares of workers by educational categories in total hours worked include the vector \(X_{i,t}\). Vector \(X_{i,t}\) contains a set of variables controlling for the observable worker, job, and firm characteristics. It provides for the share of the workforce within a firm that (i) has at least five years of tenure, (ii) is younger than 30 and older than 49 years, (iii) is female, (iv) works formal, (v) informal. \(X_{i,t}\) encompasses the natural logarithm of firm size (i.e., number of full-time workers), the natural logarithm of capital stock per worker, the level of collective wage bargaining (1 dummy), sectoral affiliation (17 dummies), a region where the firm is located (2 dummies), and 2-year dummies.

Estimating equations (1) and (2) allow us to measure the effect of education on firm productivity and wage costs. However, the testing does not directly verify the difference between the added value and wage cost coefficients. A simple method to test the significance of productivity-wage gaps has been proposed by van Ours and Stoeldraijer (2011), and it is explained in estimating Equation (3):

\[
\left[ \ln \left( \frac{\text{Value Added}}{\text{Hours}} \right)_{it} - \ln \left( \frac{\text{Wage Cost}}{\text{Hours}} \right)_{it} \right] = \alpha^{**} + \sum_{j=1}^{J} \beta_j^{**} \text{Education}_{j,it} + \lambda^{**} X_{it} + \epsilon^{**}_{it} \quad (3)
\]

The difference between firm \(i\)'s log hourly value-added and log hourly wage costs (i.e., the log of the ratio between value-added and wage costs) regress on the same set of explanatory variables as in Equations (1) and (2). It produces coefficients for the educational variables and directly measures the size and significance of their respective productivity-pay gaps.

3. Results

3.1. Estimates across job field categories and groups of workers

Various theoretical arguments suggest in particular that the effects of education on productivity and wages vary across educational categories (from elementary school/below until university), job field categories (from A until Q), and by gender (women and men).
3.1.1. Do workers’ educational categories matter?

Workers’ educational categories matter with labor wages per year presented in Figure 1. In line with the increasingly high level of education, the average labor wage per year also increases. The average wage of workers completing university education is approximately IDR 3.57 million until IDR 5.22 million for all gender, almost three times the average wage of workers with elementary education and below, which is only IDR 1.57 million. Women and men workers from elementary education/below until vocational high school have increased the average wage of workers from 2018 through 2019, respectively.

3.1.2. Do workers’ job field categories matter?

The average labor wages per year by primary employment in 17 job field categories and gender shown in Figure 2. Results reported in Figure 2 estimate that job field category K (financial and insurance activities) is the highest monthly average of the wage of laborers among other fields with
an average wage IDR 4.01 million by women, whereas men’s category K with the IDR 4.17 million as the third-largest average wage. On the other hand, the highest yearly average wage for men is in job field category B (mining and quarrying) with IDR 4.65 million, whereas the women with the IDR 3.85 million for the second-largest average wage. As figure 2 shows, men have category J (information and communication) as the second-largest wage in the job field category. Meanwhile, the lowest monthly average of the wage of laborers for women is in category Q other services activities and category A (agriculture, forestry, and fishing) for men.

The largest yearly average of wages of laborers in 17 job field categories is followed by category B (mining and quarrying), category K (financial and insurance activities), and J (information and communication) in 2019 in Figure 3, respectively. Meanwhile, the lowest monthly average of net wage/salary/income of laborer in 2019 is in category Q (other services activities) and A (agriculture, forestry, and fishing). The lowest yearly average is observed mainly in rural areas, whereas the highest yearly standard is in urban areas. By 2018 through 2019, the average wage of laborers rose from IDR 3.80 million to IDR 4.69 million in category B (mining and quarrying), whereas category K (financial and insurance activities) and J (information and communication) have declined.

![Fig. 3. Average labor wages per year by primary employment in 17 job field categories (IDR million), 2018-2019](image)

3.1.3. Does workers’ gender matter?

Gender was categorized by men and women based on educational categories. The average labor wages per year (IDR million) according to completed educational qualifications and gender were shown in Figure 1. The gender wage gap for men and women exists in all educational categories. Even though women have achieved the same educational qualifications, their wages continue to be lower. For example, the average wage of men university graduate workers in 2018-2019 was higher than graduate university women workers. In contrast, the average wage of women and men workers with university education has been slightly decreasing year to year; women from IDR 3.57 million (2018) to IDR 3.54 million (2019), whereas men from IDR 5.22 million (2018) to IDR 5.15 million (2019).
4. Discussion

The results confirm that in Indonesia, Belgium, and Israel, there is a glass ceiling in female career development, particularly in preventing them from reaching top positions. There is evident discrimination against women in many nations, particularly in Indonesia. Even though women’s job opportunities have increased, in Indonesia, there is a serious lack of women in high positions. Moreover, women’s job opportunities are limited in job field categories.

In the formal working urban area in 2018, there were 37,929 manufacturing industries in Indonesia, with an increase in 7,062 new manufacturing companies from 2017. The women’s jobs are largely only for nonprofessional occupations known as “buruh pabrik” which entail factory labor. The yearly average of the wage of laborers in Category B (mining and quarrying), is the highest compared to other sectors, followed by Category K (financial and insurance activities), and Category J (information and communication), respectively. Meanwhile, the lowest monthly average of the wage of laborers is in Category Q (other services activities) and Category A (agriculture, forestry, and fishing). Category Q and A mainly dominated by males in nonformal jobs, rural areas. Category B, K and J are dominated by men and women because this sector mostly incorporates service and urban areas.

Some women work in professional occupations before marriage, after which, the women quit their jobs and focus on caring full-time for their children. Indonesia has a Muslim majority of 87% as compared to other religions. After marriage, as per Muslim culture, women should ask their husbands for permission to work. Moreover, Indonesian culture dictates that men, not women, should be the providers for the family (Vebtasvili, 2016).

If men/husbands cannot provide for their family and are not opposed to their wives working, women usually quit their jobs and focus on children’s development. In urban areas, it is a woman’s choice as to whether or not she should stop working. However, most women in rural areas do not have the option to reject decent marriage proposals. These women tend to be in an unfavorable situation if they are poorly educated, and as they are obedient to parents’, the same goes for rules enforced by their husbands, families, and even society.

The understanding of contemporary Islam and Muslims in Southeast Asia should be investigated as historically and sociologically knowledge. The Southeast Asian region, along with the government and administration of three colonial systems (Portuguese, Dutch, and British), is the heir to Hindu and Buddhist traditions. It is embedded’ in historical fact centered on a ‘knowledge baseline,’ of the cultural diversity. The pluralism concept in sociological from “plurality” to “plural society” to “diversity” (Shamsul, 2005; 2018).

Islam is a very important in Southeast Asia and highly relevant in terms of cultural diversity for various reasons. First, at present, Indonesia is the world’s largest Muslim country, with around 200 million Muslims. Moreover, there are more than 250 million Muslims—approximately 40% of the region’s total population—in Southeast Asia. Islam is not only followed by the majority populations in Indonesia, but also Malaysia, and Brunei and among minority communities in other Southeast Asian countries, including Thailand, Vietnam, Cambodia, the Philippines, and Singapore.

Second, Islam has historically been an essential basis of cultural identity in the region, alongside
other dominant world religions like Buddhism, Hinduism, and Christianity that often blend in some traditions in minor local beliefs and regional folk traditions. Furthermore, Islam has also provided cultural/social codes or moral or ethical values, and norms for believers, including what one should and should not do, eat, or wear. It plays notable roles with collective social domains in politics, jurisprudence, education, the economy, and business.

Third, Southeast Asia is also one of the most culturally diverse areas in the world. In terms of linguistic diversity, there are dozens of local dialects in most Association of Southeast Asian Nations (ASEAN) countries and official (national) languages by respective governments. The social relevance of cultural and ethnic diversity in regions where Muslims in Southeast Asia live in a highly diversified socio-cultural setting is undeniable. Cultural (or religious) diversity has been used mainly in the intercultural or inter-religious sense, such as Muslim and Non-Muslim relations (Tokoro, 2015; Tokoro and Tomizawa, 2018).

Indonesia officially recognizes six religions, namely Islam, Protestant Christianity, Catholic Christianity, Hinduism, Buddhism, and Confucianism. Judaism does not belong to the religions in Indonesia, although Jews were regularly present during, at least, the last 400 years. Judaism arrived in Indonesia along with early European explorers and settlers in the 17th century. Nevertheless, there is a long history of Jewish presence in the archipelago, and after World War II, most Jews left Indonesia and emigrated to various European countries, the US, and Australia; a few even emigrated to Israel (Klemperer-Markman, 2020).

Muslim society assumes that a woman’s role in the family is essential for children’s improvement in sholeh/sholehah (religiosity), religious education (Qur’an recitation, don/prayer, salat, etc.), character building, attitude, politeness, etc. When the family environment supports the children’s improvement, children can quickly adapt to the social environment. The family plays a major role in teaching children, in contributing towards their children’s human capital investments, and in the formation of attitudes and values, which are crucial for their optimal development. The family—the mother in particular, but parents in general—act as primary caretakers and invest in their children’s adaptation to society, learning of languages, education of skills, learning of values, differences between right and wrong, and ethical values. This is true in the US (Becker, 1964) as well as in traditional societies. Thus, families are crucial investors in human capital lives.

Parents who harshly beat their children cause lasting damage, while at the other end of the spectrum, sympathetic and firm parents help motivate their children. Substantial differences among young children grow over time with age and schooling because children learn more quickly when they are better prepared. Consequently, even small differences among children in the preparation presented by their families are often vast when they become teenagers. Parents have an enormous influence on education, marital stability, and many other dimensions of their children’s lives (Becker, 1964).

The educational categories of women have a significantly stronger positive effect on their productivity than on their wage cost. The findings show that highly educated women are relatively underpaid as compared to the less educated women. Whereas, for male workers, education-driven productivity gains do not deviate significantly from wage cost differentials. There is evidence that a
wage-compression effect partially supports predictions of the human capital theory, which confirms that education develops skills that make workers more productive and that wages reflect differences in productivity. The findings are also incongruent with theories relating to tournaments (Lazear and Rosen, 1981); internal decision-making processes of organizations, or monitoring issues (Bebchuk and Fried, 2003; Osterman et al., 2009) indicating that high-educated workers relatively overpaid to their respective output elasticities (Kampelmann et al., 2018).

The gender by occupation restrictions is natural because occupational distribution differs by gender. Evidence was found to be consistent with discrimination against gender in job field categories. There does appear to be any productivity differential between education categories, job field categories, and gender. Women are paid significantly less than men, and the wage differential between them is generally much larger than the productivity differential (van Ours and Stoeldraijer, 2011). The result supports women who are not on the managerial level, primarily those who work in plants-particularly those that are larger and employ many women. The evidence is also consistent with gender discrimination arising from nonmanagerial and nonprofessional occupations. Israeli society is structured to discriminate against women in other aspects of the economy, such as responsibility for home production, which may render them less productive in the workforce (Hellerstein et al., 1999a; 1999b).

The different results for the three countries may reflect real differences in labor market characteristics and outcomes for men and women, and these may also be influenced by differences in data sources.

5. Conclusions

This paper estimates the effects of education on productivity and wages in Indonesia to compare them to other countries studied by Hellerstein et al. (1999a, 1999b), van Ours and Stoeldraijer (2011), and Kampelmann et al. (2018). The results indicate that the effects of education on productivity and wages vary across educational categories, job field categories, and gender. It supports the existence of a glass ceiling on female career development from reaching top positions in Indonesia, Belgium, and Israel. However, the male worker is more dominant in Indonesia than in Belgium and Israel, which is possibly attributed to cultural and religious factors given that Indonesian norms dictate that men, not women, should be the family’s providers. The differing results for each country may reflect real differences in labor market characteristics and outcomes of men and women. They could also be caused by differences in data sources.

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