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Paid to Play Truant: The Impact of Minimum Wages on Secondary Enrolment Rates in Indonesia*

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Abstract

Despite the extensive literature investigating the impact of minimum wage legislation on employment, only a few studies have been carried out in developing countries. Furthermore, there exists only a few studies on the impact of the minimum wage on the human capital investment decisions of teenagers, and as far as I am aware there is no evidence from a developing country context. Given the importance of human capital accumulation for long run economic development, an analysis of the poverty reduction potential of introducing a minimum wage must take into account its impact on investment in human capital. Therefore, I address the question of how minimum wage legislation can impact the human capital investment decision of households in a developing country. Using data from 1990-2000 I use a multinomial logit model to estimate the impact of the minimum wage on the occupational choice of teenagers in Indonesia at the province level. It is found that between 1990 and 2000 the sharp increase in the real minimum wage reduced the proportion of teenagers enrolled in Senior Secondary education, whereas in the following decade the minimum wage had a positive impact on the enrolment rate. The effect of the minimum wage on the occupational choice of teenagers does not differ according to gender.

Keywords: Education, Minimum Wage Legislation, Human Capital

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“The most valuable of all capital is that invested in human beings.”

- Marshall (1890, paragraph VI.IV.11)

Freeman (2009) describes the goal of the minimum wage as the redistribution of income to low-paid workers. In the context of developing countries it is therefore a policy with significant potential to alleviate poverty. Due to the lack of social income, wages from unskilled labour form a larger proportion of income of the urban poor than in developed countries (Lustig and McLeod, 1997). The evaluation of the impact of the minimum wage on welfare has focused on the trade-off between a higher income of unskilled workers and net-employment effects as a result of firms substituting unskilled labour for skilled labour or capital. However, it has been argued that the emphasis on negative employment effects has ignored an important long-run impact of the policy – the impact on the incentive to invest in education (Neumark and Wascher, 1995a, b, c).

The expansion of access to education has been a fundamental development strategy for the last fifty years.¹ Human capital is one of the most important factors required for economic growth (Mankiw et al., 1992; De la Fuente and Doménech, 2006; Lutz, 2009) through its ability to raise the productivity of both labour and capital, and to facilitate innovation and technological diffusion. At the microeconomic level a higher level of educational attainment will lead to higher lifetime earnings (Psacharopoulos, 1988) and has positive externalities for society as a whole in the form of fertility control and improved child health and nutrition (Colclough, 1996), particularly as a result of the education of women (Drèze and Murthi, 2001).

According to Becker’s (1975) canonical model of human capital individuals decide whether to invest in education by comparing the immediate costs to the discounted stream of net future benefits. Therefore, the minimum wage will indirectly affect the incentive to invest in education through its effect on the wage distribution and employment of different subsets of the labour force. As the opportunity cost of education rises with age the impact of the minimum wage on educational attainment would be particularly relevant for young people choosing between obtaining a secondary education and entering the labour market in developing countries.

The previous literature has focused mainly on the employment effects of the minimum wage for young adults, however a handful of papers examine the effect of minimum wages on enrolment decisions in the United States. Neumark and Wascher (1995a, b, c; 2003;) find that minimum wages reduce both enrolment and employment, and lead to a higher proportion of teenagers remaining idle. The negative impact of the minimum wage on enrolment is confirmed by Cunningham (1981), while Ehrenberg and Marcus (1982) report no impact on teenagers from high-income families but support the evidence of a negative impact on enrolment for low income families. In contrast to this result, Mattila

¹ The importance of human capital for economic growth was emphasised by Kuznets (1960) and Lewis (1956).

(1978) finds that the minimum wage has a positive influence on enrolment rates of teenagers. The evidence is suggestive of a relationship between the minimum wage and the human capital investment decisions and motivates the investigation of this effect in a developing country context. In a related study, Steinberg and Shah (2015) report that higher wages in India increase investment in education in early life but reduce investment in education for the ages of 5-16. Therefore, the aim of this paper is to investigate the impact of the minimum wage on the incentive to invest in education in a developing country. As far as I am aware, this is the first study of the impact of the minimum wage on the occupational choice of teenagers in a developing country context.

Indonesia presents a suitable context in which to carry out this empirical analysis due to the considerable variation in the real minimum wage and the large proportion of the population living below the poverty line. The minimum wage is set at the provincial level and varies across provinces according to differences in consumer prices. Efforts by the government to ensure compliance with minimum wage laws as a result of international pressure led to a high, if imperfect, rate of compliance among Indonesian firms.

I use the empirical approach of Neumark and Wascher (1995a). The occupational choice of teenagers is modelled by assuming teenagers aged 16-18 choose between four alternative activities; in school and not formally employed (SNE), in school and formally employed (SE), formally employed and not in school (ENS) and neither formally employed nor in school (NSNE). This model gives rise to the logit model as first proposed by McFadden (1974). Micro-data is aggregated at the province level to calculate the proportion of teenagers in each category, and the model is estimated as three equations where the dependent variables are the log of the odds ratio of the proportion of teenagers SNE, SE or ENS relative to the proportion of teenagers NSNE in each province. The impact of the minimum wage on each of the three log odds ratios is estimated controlling for plausibly exogenous determinants of the secondary enrolment rate and the employment rate.

The results of the empirical analysis show that the minimum wage caused a reduction in the proportion of teenagers enrolled in Senior Secondary School in the 1990s, but had the converse effect in the following decade. During the 1990s the coefficient on the contemporaneous real minimum wage variable is negative and significant. In the following decade the lagged real minimum wage variable is positive and significant, while the contemporaneous variable is negative but not significant. The estimates imply that in the province of Jakarta, the sharp increase of the minimum wage from 1990-1995 led to a decrease in the proportion of teenagers classified as SNE relative to the proportion of teenagers classified as NSNE by 28%. The increase in the minimum wage from 2000-2005 led to an estimated increase in the proportion of teenagers classified as SNE relative to the proportion of teenagers classified as NSNE of 7%. The estimated impact of the minimum wage on the proportion of ENS teenagers to NSNE during the 1990s is not significant, however the rise in the minimum wage from 2000-2005 is positive and significant and reduced the ratio by an estimated 6%. The results of the empirical analysis do not differ between males and females, which lends support to the assertion of

Kevane and Levine (2003) that the gender bias in the intra-household allocation of educational expenditure in Indonesia had disappeared by the 1990s.

Using a simple model of investment it is shown that the minimum wage influences the human capital investment decision of households through its effect on the skill premium. Given that the sharp increase in the minimum wage directly raised the skilled wage and subsequently the incentive to remain in education, it is theorised that during the 1990s the economic expansion of Indonesia led to an increase in the expected wage of unskilled workers through employment opportunities in the informal sector and the proximity of the informal sector wage to the wage floor. However, this hypothesis cannot be confirmed due to a lack of data concerning the informal sector wage distribution and employment rate, therefore it is offered tentatively. The rise in the Senior Secondary School (SS hereafter) enrolment rate during the 2000s in response to the rise in the minimum wage implies that the minimum wage raised the skill premium sufficiently to encourage individuals to remain in school.

The difference in employment prospects in the informal sector is offered as an explanation for the difference in the effect of the minimum wage on secondary enrolment rates across the two decades under consideration. Whilst in the 1990s youths perceived employment prospects to be promising due to the rapid economic expansion, the aftermath of the 1997-1998 South East Asian financial crash and the general trend of jobless growth the following decade no longer provided such an attractive alternative to remaining in formal education. The results of the empirical investigation indicate that when considering the costs and benefits of implementing a minimum wage, developing countries should take into consideration how the economic climate may influence the human capital investment decision of teenagers which will have repercussions in terms of long-run economic development.

The paper will proceed as follows. Section 2 describes the Indonesian context and describes the evolution of the enrolment rates and the minimum wage over time. Section 3 presents a simple theoretical model of human capital investment in order to theoretically analyse the channels through which the minimum wage will influence human capital investment decisions. Section 4 describes the empirical approach. Section 5 presents the sources and limitations of the data used in the empirical analysis. Section 6 presents the results and a robustness analysis, and Section 7 concludes.

2. Indonesian Context

Indonesia is an archipelago of 17,508 islands, 6,000 of which are inhabited by a population of approximately 250 million people (OECD, 2015). It is the fourth largest country in the world covering an area of 5000km, and is rich in natural resources such as oil and fertile agricultural land.

2.1.1 1990-2000: Boom and Bust

During the early 1990s Indonesia experienced rapid economic expansion; GDP growth averaged 7.8% between 1990 and 1996. However, in 1997 economic progress came to a sudden halt as a result of the South East Asian financial crash. Economic growth fell to -13.1% in 1998, the value of the Rupiah

plummeted and the Jakarta Stock Exchange crashed as a result of risky lending by domestic banks. The economic crisis resulted in rioting and mobs calling for the resignation of President Suharto. The IMF also exerted pressure for economic reform in order to obtain much-needed financial assistance. President Suharto publicly resigned on the 21st of May 1998. As a result of Indonesia's first democratic election, President Wahid took control in October 1999 and the country entered into the new millennium by signing a new Extended Fund Facility agreement with the IMF.

2.1.2 2000-2010: Transition to Democracy

The following decade Indonesia recovered from the South Asian Crisis and maintained an economic growth rate of approximately 5%. The economy showed resilience to the 2007-2008 financial crisis despite its negative impact on the world economy. However, the economy showed a trend of “jobless growth”; population growth was not translated into employment growth despite sustained economic growth. The World Bank (2011) diagnosed labour market regulations as a barrier to job creation. Furthermore, following the 1998 crisis employment in low-productivity agricultural employment expanded and persisted throughout the decade.

2.2 The Education System of Indonesia

The diversity and immensity of Indonesia is reflected in its education system, the fourth largest in the world. The secondary education system is divided into two stages. After six years of primary education individuals enter Junior Secondary School (JS) for three years, before moving into Senior Secondary School (SS) at the age of 16 to 18. Senior Secondary School can be either general (*Sekolah Menengah Atas*) or vocational (*Sekolah Menengah Kejuruan*). Given that JS became compulsory in 1994, the primary focus of the empirical analysis will be on the choice faced by teenagers at the age of 16 between continuing in SS and entering the labour force.

2.2.1 Evolution of the JS and SS GER Over Time

Despite the attempts to stimulate enrolment into JS and SS, total secondary enrolment rates remained low at the beginning of the 1990s, and only rose from 44.5% to 55% between 1990 and 2000 (see Figure 1). In 2000 the Indonesian government expanded the Senior Secondary education sector, increasing the number of schools from 12,415 in 2001 to 26,896 by 2012. The Ministry of Education attempted to reduce the cost of education by providing text books for free on the internet and controlling the price of hardcopies (Bulman, 2008). Efforts were also made to increase the number of qualified secondary teachers. The policy led to an increase in the total secondary GER from 55% to 77%, a noticeably larger increase than in the previous decade. Furthermore, the gender gap in secondary education was closed.

However, the total secondary GER conceals the significant difference between the enrolment rates of JS and SS, and between urban and rural areas (OECD and ABD, 2015). Figure 2 separates the GER for senior secondary and junior secondary school and indicates the disparity between the JS GER and the SS GER. Figures 3a and 3b indicate considerable fluctuation in both the SS GER and the JS GER between provinces. Several provinces have districts with a gross enrolment rate below 30% (Indonesian Ministry of Education and Culture, 2012b).

2.3 The Minimum Wage

Figure 4 illustrates the evolution of the nominal and the real minimum wage over time for the province of Jakarta. The minimum wage is set annually at the province level by decentralised provincial councils. As a result of international and domestic pressures to improve labour market conditions for workers in Indonesia, from 1990-1995 the nominal wage tripled while the real minimum wage doubled. International activism and a desire for the benefits of economic expansion to be passed on to workers were some of the factors driving the policy decision to raise the wage floor. In 1989 new legislation was introduced which aimed to bring the minimum wage in line with the KHM, a consumption bundle thought to capture subsistence needs, the cost of living and labour market conditions, by 1994. As a result of the decentralised nature of the setting of the minimum wage there was considerable variation in both the nominal and the real wage floor across the 34² provinces of Indonesia. While the nominal wage continued to rise over time after 1994, the real minimum wage was eroded due to the high inflation rate following the South East Asian financial crash of 1997-1999 (Magruder, 2012). In 1999 the real minimum wage fell back to the level it had been in 1991, but rose sharply as the inflation rate stabilized after the crisis. The real minimum wage remained constant between 2002 and 2006 and did not rise above its pre-crisis value until 2007. Following the Great Recession of 2007-2008 the real minimum wage rose significantly as the government attempted to raise the incomes of low-skill workers to maintain confidence and economic growth.

As a result, there is considerable variation in the real minimum wage at the province level from 1990 to 2010 which offers an opportunity to investigate the impact of the real minimum wage on the occupational choice of teenagers.

3. Theoretical Model

A simple model of investment in human capital will be used to examine the factors contributing to the occupational choice of teenagers. The model is in the spirit of Becker's (1975) canonical model of investment in human capital, and also draws from Acemoglu and Autor (2000).

² Prior to 1999 there were only 26 provinces, but between 1999 and 2015 eight new provinces were established.

3.1 Simple Two-Period Model of Investment in Human Capital

Assume a household made up of one child and one parent. The parent lives for one period, earns wage income equal to y_i , consumes c_i , and decides whether to invest in the education of their child, s_i . The income of the parent is a function of their human capital, h , which is assumed to be fixed. Therefore, $y_i = f(h)$. It is assumed that $\frac{\partial y_i}{\partial h} > 0$; parental income is increasing in parental human capital. At the end of the first period the parent dies. During the second period the child earns the wage of an unskilled worker if they did not attend school, w_u , or the wage of a skilled worker if they did attend school, w_s . The child consumes $\hat{c}_i$. The household utility function is defined according to (1):

$$U(c_i + \hat{c}_i) = \ln c_i + \ln \hat{c}_i \quad (1)$$

An implicit assumption is that education does not directly raise the utility of the household, but has an indirect effect on welfare due to the higher level of income and consumption obtained as a result of education. Therefore, it does not appear in the objective function. In the presence of perfect capital markets, the parent is able to borrow at the interest rate, r , on behalf of their child. The household's maximisation problem is therefore to maximise household utility subject to (2), the household budget constraint:

$$c_i + \frac{\hat{c}_i}{1+r} = y_i - s_i \theta_i + \frac{w_u}{1+r} + s_i \frac{w_s - w_u}{1+r} \quad (2)$$

Where θ_i captures both the direct and opportunity costs of education and is different for every child, i . The level of education, s_i , will be chosen in order to maximise household utility. It can be shown that in order for the household to invest in education, equation (3) must be satisfied:

$$\theta_i \leq \frac{w_s - w_u}{1+r} \quad (3)$$

Where $w_s - w_u$ is the skill premium; the difference between the wage received by skilled and unskilled workers. Equation (3) states that in order for the household to send their child to school the total cost of education must be less than or equal to the net present value of the increase in earnings as a result of obtaining an education.

The model implicitly assumes that parents are fully altruistic towards their child as in the model the parent is willing to borrow in order to finance their child's education. In reality parents may be unwilling to do so. Furthermore, the assumption of perfect capital markets is strong, particularly in the

context of a developing country. Even if some individuals are able to borrow in order to smooth consumption over time, it is acknowledged that the poorest in society are likely to be credit constrained (Ray, 1998). Indeed, Johnston and Morduch (2007) found evidence that debt aversion is prevalent in Indonesia, regardless of income or assets, which further merits the presentation of the model with a restriction to access of credit markets.

It is assumed that households are either unable or unwilling to borrow, therefore savings cannot be negative. For simplicity it is further assumed that savings are zero in both periods, therefore the following constraints describe the model with no access to credit:

$$c_i = y_i - s_i \theta_i \quad (4)$$

$$\hat{c}_i = w_u + s_i(w_s - w_u) \quad (5)$$

Equations (4) and (5) stipulate that the income of the parent in the first period is equal to income less the cost of education while the income of the child is equal to the wage earned given the education obtained in the previous period.

Becker's (1975) canonical model stipulates that an investment in human capital will be undertaken if the present cost of the investment is less than or equal to the present value of the net benefits. Therefore, in the context of the simple two-period model under consideration, the household will invest in the human capital of the child if utility from investing in education is greater than the utility obtained with no investment in education. The household utility obtained from not investing in education, where s_i is equal to zero, is given by equation (6):

$$U(s_i = 0 \mid y_i, \theta_i) = \ln(y_i) + \ln(w_u) \quad (6)$$

The utility obtained when the household does invest in education, where s_i is equal to one, is given by equation (7):

$$U(s_i = 1 \mid y_i, \theta_i) = \ln(y_i - s_i \theta_i) + \ln(w_s) \quad (7)$$

In order for the benefit of an investment in human capital to outweigh the cost, it can be shown that equation (8) must be satisfied (see Appendix for derivation):

$$\frac{y_i(w_s - w_u)}{w_u} \geq \theta_i \quad (8)$$

According to (8), the threshold condition for investing in education, the following factors will influence a household's decision of whether to send their child to school:

i) Costs of Schooling: θ_i

The higher are the direct and indirect costs of education, the lower will be the net benefit of investing in human capital. Direct costs include school fees, the cost of the school uniform and books, and any transportation required for the child to reach school. The opportunity costs of education include foregone earnings from the child working in the formal labour market, the informal labour market, or output generated from working within the household.

ii) Household Income: $y_i = f(h)$

The higher is the income of the household, the lower will be the present costs of education as a percentage of household income. Therefore the net benefit of education will be higher. The human capital of the parent will determine whether they receive the wage of a skilled worker or an unskilled worker. Therefore, a more educated parent earns a higher income and is more likely to invest in the education of their child.

iii) Skill Premium: $(w_s - w_u)$

The skill premium associated with the attainment of education will raise the net benefit of investing in human capital. Therefore, the wage of skilled workers has a positive effect on the net benefit of investment in education while the wage of unskilled workers has the converse effect. In a competitive labour market the wage premium will be determined by the demand for and the supply of skilled and unskilled labour.

In order to integrate the theoretical model with the empirical analysis of Section 5, it is necessary to specify that in the Indonesian context skilled wages are earned in the formal sector by those who have completed SS or above, while the unskilled wage is earned by workers with JS education of below in the formal sector. Due to the minimum wage not binding in the informal sector and a lack of reliable wage data, the focus of the empirical analysis is the choice between formal employment and education. Furthermore, the simple theoretical model abstracts away from the choice of teenagers to spend part of their time studying and part of their time working in order to pay for their education. This occupational choice is also considered in the empirical analysis.

3.1.2 Transmission Mechanisms – Impact of the Minimum Wage

The implication of the simple two-period model is that the minimum wage will influence investment in human capital through its impact on the skill premium. If unskilled workers are eligible for the minimum wage, a rise in the minimum wage will reduce the skill premium by raising the wage of unskilled workers. As a result, there would be less incentive to remain in education. However, if only skilled workers are eligible for the minimum wage, the incentive to remain in education will be higher.

i) Employment Effects

When considering the benefits of education, it is possible that households calculate the present value of future earnings based on the expected wage (Brown, 1999) in order to take account of the uncertainty associated with obtaining employment when making their investment decisions. The expected wage is the product of the wage and the probability of getting a job. Therefore, the impact of the minimum wage on the benefit of education will depend not only on the level of the minimum wage but also on the probability that an individual is able to obtain a job offering the minimum wage. If the increase in the minimum wage is offset by a fall in the probability of obtaining a job due to a negative employment effect, it will not raise the opportunity cost of education and individuals will remain in school. However, if the negative employment effects are small the rise in the minimum wage can raise the opportunity cost of education enough for individuals to abandon education in favour of seeking employment. The analysis of the impact of the minimum wage on human capital investment must therefore take into account the impact of the minimum wage on employment.

In order to analyse the impact of the minimum wage on employment in a developing country it is necessary to assume the framework of a two-sector labour market (Welch, 1976; Gramlich, 1976; Mincer, 1976) in order to model the formal sector in which the minimum wage is binding and the informal sector in which it is not. Allowing for differing levels of skill within the workforce (Neumark and Wascher, 2008) leads to the prediction that employment effects can be different for different segments of the labour market due to employers substituting unskilled labour for skilled labour. The predicted employment effects of the implementation of the minimum wage will depend on the labour market structure.

Under the assumption of a perfectly competitive neoclassical labour market low-skilled workers experience a negative employment effect in the formal sector. However, the negative employment effects can be offset if employment can be found in the informal sector where the wage floor is not binding (Brown, 1999). The substitution of low-skilled for high-skilled labour will raise the net benefit of investing in human capital by reducing the expected unskilled wage and raising the expected skilled wage. In contrast, the predicted impact of an increase in the minimum wage in a monopsonistic labour market is one of higher employment (Neumark and Wascher, 2008). The combination of a higher probability of employment and a higher minimum wage would raise the

expected wage of unskilled workers. However, this negative effect on the incentive to invest in education could be offset by a higher employment rate of skilled workers. The theoretical predictions of the employment effects of the minimum wage are ambiguous.

The evidence concerning the employment effects of the minimum wage in Indonesia suggests that young workers faced a lower probability of formal sector employment as a result of the increase in the minimum wage. Rama (2001) finds that the sharp rise in the wage floor during the 1990s caused a negative employment effect in smaller firms whereas larger firms responded by expanding employment. Magruder's (2012) finding's support this evidence that smaller firms operate in a competitive labour market while larger firms are monopsonistic employers. Suryahadi et al. (2003) report negative and statistically significant employment effects for blue collar, female and young workers. They conclude that firms substituted low-skill workers for high-skilled workers, and their findings are consistent with a competitive labour market.

ii). Wages in the Informal Sector

In the context of the two-sector model described above it is also possible to analyse the effect of the minimum wage on the wage in the informal sector of the labour market. Under the assumption that the wage is determined competitively in the uncovered sector, an increase in the supply of workers as a result of lower employment in the covered sector would reduce the wage in the uncovered sector. However, it has been found in some developing countries that the minimum wage leads to a wage spike in the wage distribution within the informal sector (Lemos, 2006a). This phenomenon has been attributed to the fact that in some countries the informal sector will compete with the formal sector for employees, and will therefore set the wage equal to the minimum wage in the formal sector (World Bank, 2006). As a result, the minimum wage may increase the expected wage of the informal sector despite legislation not binding employers to offer the minimum wage. The opportunity cost of education would be higher as a result.

Spillover effects can also change the wages of individuals higher up in the wage distribution. If the demand for highly skilled individuals rises the wage of individuals who earn more than the minimum wage would also rise. Alternatively, firms may maintain the skill premium and therefore will be forced to raise the wage of skilled workers when implementing the wage floor. The minimum wage could therefore raise the expected wage of skilled labour, which would raise the net benefit of investing in human capital.

3.1.3 The Role of Cultural Norms

Although the simple two-period model highlights a variety of factors which influence the human capital investment decisions of households, one important factor with particular relevance to a developing country context is not included in the model. In many developing countries cultural norms concerning the role of women in society will impact the decisions of households concerning the investment in the education of girls. Societies in which women are expected to work in the household will place little value on the education of females as a result of entrenched norms concerning the gender division of labour (Drèze and Sen, 1995). It is well known that in Asian countries such as China (Song et al, 2006) and India (Kingdon, 2002) households have a son-preference which results in the attachment of more weight to the welfare of sons than to the welfare of daughters. Kevane and Levine (2003) argue that although Indonesia is not known for its son-preference, education expenditure has been biased towards sons in the past. Therefore, the impact of changes in the minimum wage in Indonesia may differ among males and females as a result of cultural norms concerning gender differences in the allocation of resources.

In sum, the minimum wage will directly impact the wages of formal sector workers and will indirectly impact on the probability of employment and the wage offered in the informal sector. The model has established that if the minimum wage decreases the skill premium and lowers the probability of formal sector employment, the effect of an increase in the minimum wage will be to decrease investment in education. On the other hand, if the minimum wage increases the probability of employment and has little effect on the skill premium (because skilled salaries are also raised in response to an increase in the wage floor), then increases in the minimum wage will lead to larger investment in education. It is necessary to turn to empirical analysis in order to disentangle the complex theoretical relationship between the minimum wage and SS enrolment rates.

4. Empirical Approach

In order to identify the impact of the minimum wage on the occupational choice of teenagers I will follow the approach of Newark and Wascher (1995a). The occupational choice of teenagers is divided into four different categories; in school and formally employed (SE), in school but not formally employed (SNE), formally employed and not in school (ENS) and neither formally employed nor in school (NSNE). As previously stated in Section 2, employment in this context refers only to formal employment. Therefore, NSNE includes informal employment and employment within the household. It is assumed that in each time period t young people choose between one of the four alternative activities such that:

$$y_{ijt} = \begin{cases} 1 & \text{if the } i\text{th respondent chooses option } j, \text{ and;} \\ 0 & \text{if the } i\text{th respondent chooses some other option } k \neq j \end{cases} \quad (9)$$

Each individual i makes a choice $y_{ijt} = 1$ if activity j is chosen in period t . This choice is influenced by a set of variables Z_{jit} which includes activity-specific and individual-specific factors which influence the utility of participating in each activity. Individual i 's utility from the j th choice in period t is determined by an additive random utility model:

$$U_{ijt}(Z_{it}) = Z_{jit}\gamma_j + \varepsilon_{ijt} \quad (10)$$

where U_{ijt} is the utility derived from option j for individual i in time period t , Z_{jit} includes variables which influence the costs and benefits of participating in each activity, γ_j is a vector of coefficients capturing the impact of variables Z_{jit} on the utility of each activity³, and ε_{ijt} represents unobservable individual specific tastes or abilities and unobservable costs or benefits of each activity. Under the assumption that the unobservable error term is independently and identically distributed according to a Type 1 extreme value, this specification gives rise to the conditional logit model. The probability that individual i chooses activity j in time period t given characteristics Z_{it} is the probability that the utility derived from activity j is greater than the utility derived from the other options k , given $k \neq j$. Therefore, the conditional probability of individual i choosing option j can be expressed as⁴:

$$\begin{aligned} \Pr(y_{it} = j \mid Z_{it}) &= \Pr[U^{(j)}(Z_{it}) > U^{(k)}(Z_{it}) \mid Z_{it} \forall j \neq k] \\ &= \Pr[Z_{it}\gamma_j + \varepsilon_{ijt} > (Z_{it}\gamma_k + \varepsilon_{ikt}) \mid Z_{it} \forall j \neq k] \\ &= \Pr[\varepsilon_{ikt} < (\varepsilon_{ijt} + Z_{it}\gamma_j - Z_{it}\gamma_k) \mid Z_{it} \forall j \neq k] \\ &= \frac{\exp[Z_{it}\gamma_j]}{\sum_k \exp[Z_{it}\gamma_k]} \end{aligned} \quad (11)$$

Aggregating the occupational choice of teenagers across individuals at the provincial level for each year leads to the following expression for the proportion of young people engaged in activity j in state h in time period t :

$$Pr_{jth} = \frac{\exp[Z'_{ht}\gamma_j]}{\sum_k \exp[Z'_{ht}\gamma_k]} \quad (12)$$

³ Initially it is assumed that the value of γ is constant across time periods, however this assumption will be relaxed in Section 5.

⁴ The notation used is indebted to Train (2003) and Quinn (2015).

The variables in $\mathbf{Z}'_{ht}$ now capture factors at the province level which will impact on the proportion of teenagers engaged in each activity. The system of equations is unidentified unless the utilities are expressed in relative terms. Therefore, the utilities are normalised relative to the base category NSNE and the occupational choice of teenagers can be expressed by the following system of equations:

$$NSNE_{ht} = \frac{1}{1 + \sum_k \exp[\mathbf{Z}'_{ht}\boldsymbol{\gamma}_k]} \quad (13)$$

$$SNE_{ht} = \frac{\exp[\mathbf{Z}'_{ht}\boldsymbol{\gamma}_1]}{1 + \sum_k \exp[\mathbf{Z}'_{ht}\boldsymbol{\gamma}_k]} \quad (14)$$

$$ENS_{ht} = \frac{\exp[\mathbf{Z}'_{ht}\boldsymbol{\gamma}_2]}{1 + \sum_k \exp[\mathbf{Z}'_{ht}\boldsymbol{\gamma}_k]} \quad (15)$$

$$SE_{ht} = \frac{\exp[\mathbf{Z}'_{ht}\boldsymbol{\gamma}_3]}{1 + \sum_k \exp[\mathbf{Z}'_{ht}\boldsymbol{\gamma}_k]} \quad (16)$$

The model can be transformed into a set of three equations specifying the logarithms of the odds ratios as a linear function of a set of independent variables:

$$\log\left(\frac{SNE_{ht}}{NSNE_{ht}}\right) = \mathbf{Z}'_{ht}\boldsymbol{\gamma}_k + \varepsilon_{hjt} \quad (17)$$

$$\log\left(\frac{ENS_{ht}}{NSNE_{ht}}\right) = \mathbf{Z}'_{ht}\boldsymbol{\gamma}_k + \varepsilon_{hjt} \quad (18)$$

$$\log\left(\frac{SE_{ht}}{NSNE_{ht}}\right) = \mathbf{Z}'_{ht}\boldsymbol{\gamma}_k + \varepsilon_{hjt} \quad (19)$$

Equations (17) – (19) therefore represent the logarithm of the ratio of the proportion of teenagers classified as SNE, ENS and SE to the proportion of teenagers classified as NSNE.

5. Data

In order to estimate the impact of the real minimum wage on the occupational choice of teenagers it is necessary to combine data on the minimum wage at the province level with aggregated micro-data.

5.1 Micro-Data

The annual National Socio-Economic Survey (*Susenas*) is a large-scale household survey which typically includes approximately 200,000 households. It records information concerning the age, gender, and main activities of household members and the components of household expenditure for a nationally representative sample. The annual National Labour Force Survey (*Sakernas*) records the labour market characteristics such as the employment status and wages of eligible individuals in sampled households. It is a survey of approximately 60,000 households. Both surveys are repeated cross

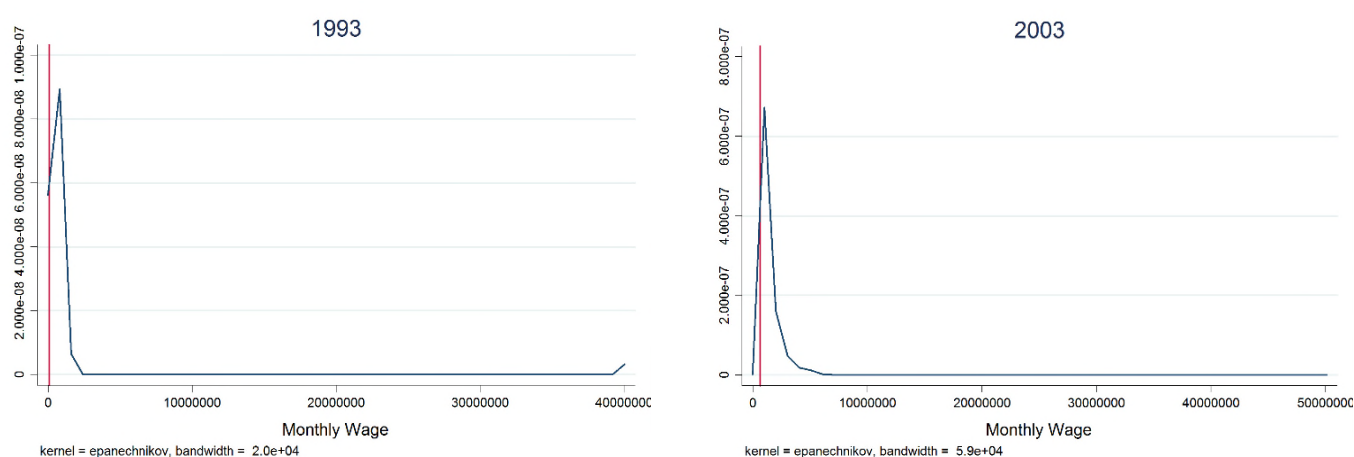
sections and are homogenous throughout the time period under consideration. The micro-data sets can be obtained by contacting Badan Pusat Statistik Indonesia (BPS Indonesia hereafter).

5.2 Minimum Wage Data

Data for the nominal minimum wage at the province level was taken from two sources. The daily nominal minimum wage per province, calculated by Rama (2001) for the years 1988-1996, was combined with the publicly available monthly nominal wage data for the years 1997-2010 from BPS Indonesia. The conversion to the real minimum wage was calculated using the average annual CPI from the capital city of each province.

The magnitude of the impact of the minimum wage on the occupational choice of teenagers will depend on the degree of compliance of firms with minimum wage legislation. As a result of the international scrutiny of labour market conditions in Indonesia the government has taken care to ensure that minimum wage laws are binding. Measures used to ensure compliance include the public “shaming” of firms which fail to adhere to the provincial minimum wage which leads to the striking of workers and a small fine of \$50. Arguably, the main incentive is not the small monetary sanction but the possibility of labour strikes and the loss of demand as a result of consumers boycotting firms not adhering to minimum wage laws.

Inspection of the wage distribution can reveal whether there is compliance with minimum wage legislation. A spike in the wage distribution at the level of the minimum wage should be observed if it is binding. Figure 5 shows kernel density estimates of the wage distribution of formal employees in Jakarta according to the Sakernas data for the years 1993 and 2003. The nominal minimum wage is represented by the vertical red line. In each year there is a clear spike in the wage distribution around the minimum wage, although a proportion of the population remains below it. Therefore, it can be concluded that the minimum wage affected the wage distribution sufficiently to enable an analysis of the impact of the minimum wage on the level of investment in human capital, although compliance was not perfect.



5.3 The Rate of Compliance

In the literature analysing the economic impacts of the minimum wage different methods have been used to construct the real minimum wage variable. The most commonly used index is the ratio of the real minimum wage to real average formal sector earnings multiplied by the proportion of employees for whom the minimum wage is binding in the formal sector. Given the unknown rate of compliance among firms it is not possible to accurately calculate the proportion of employees in the formal sector covered by the minimum wage. Therefore, in order to get as close as possible to the aforementioned index I have calculated the real minimum wage, the real average wage in the formal sector, and a proxy variable for the degree of compliance calculated as the proportion of individuals who earn a wage below the minimum wage for each province.

6. Empirical Analysis

Equations (20) – (22) will be estimated according to the following specifications:

$$\log\left(\frac{SNE_{ht}}{NSNE_{ht}}\right) = \alpha_{11}MW_{ht} + \alpha_{12}MW_{ht-1} + \mathbf{Z}'_{ht}\gamma_1 + S_t \lambda_1 + Y_t \theta_1 + \varepsilon_{1ht} \quad (20)$$

$$\log\left(\frac{ENS_{ht}}{NSNE_{ht}}\right) = \alpha_{21}MW_{ht} + \alpha_{22}MW_{ht-1} + \mathbf{Z}'_{ht}\gamma_2 + S_t \lambda_2 + Y_t \theta_2 + \varepsilon_{2ht} \quad (21)$$

$$\log\left(\frac{SE_{ht}}{NSNE_{ht}}\right) = \alpha_{31}MW_{ht} + \alpha_{32}MW_{ht-1} + \mathbf{Z}'_{ht}\gamma_3 + S_t \lambda_3 + Y_t \theta_3 + \varepsilon_{3ht} \quad (22)$$

In these equations, h indexes states and t indexes time. Variable MW_{ht} is the real minimum wage in state h and time t . The lagged minimum wage is included as a control given evidence that there is a lagged effect of the minimum wage on employment (Neumark and Wascher, 1992).

Vector $\mathbf{Z}'_{ht}$ contains plausibly exogenous determinants of the cost and benefit of each activity at the province level. The unemployment rate of prime aged males (aged 16-24) and the relative size of the schooling age cohort are included as measures of the demand and supply of labour respectively. Additional variables are included in order to control for time varying factors across provinces which are both correlated with the minimum wage and the secondary enrolment rate or the employment rate. The controls include the percentage of the population living in an urban area, the average wage of formal sector workers, the average household size, the percentage of women engaged in formal employment in each state and the rate of compliance variable. The total real wages of formal sector workers is included as a proxy for differences in the Real GDP across provinces. A dummy variable controls for the change in the compulsory schooling age to 15 in 1994. State fixed effects, λ_j , and time dummies, θ_j , are also included.

6.1 Method

In order to estimate equations (20)–(22) I will use a Fixed-Effects Feasible Generalised Least Squares method. Not only are time invariant state fixed effects controlled for, but the FE-FGLS estimator also accounts for heteroscedasticity and AR(1) serial correlation within individual provinces (Neumark and Wascher, 1995a).

I carried out FE-FGLS estimation in three steps. Firstly, I estimated the Fixed Effects model with no adjustment to the standard errors. I then predicted the coefficient of serial correlation for each individual province and weighted the variables in the model using these estimated coefficients. Finally, I estimated the transformed model using cluster robust standard errors in order to account for within-province correlation of the errors.

The two decades under consideration, 1990-2000 and 2000-2010, will be analysed separately as a result of the change in the economic context between the two decades which leads to a structural break in the relationship between the minimum wage and the investment in human capital.

6.2 Identification

In a panel data setting it is possible to control for time invariant unobservable province characteristics which lead to differences in employment rates and enrolment rates across provinces. However, time varying unobservable factors which impact the occupational choice of teenagers at the province level will lead to endogeneity bias if they are correlated with the independent variables and are not directly controlled for. For example, if the minimum wage variable is positively correlated with the provincial GDP which changes over time and is correlated with the secondary enrolment rate, the coefficient on the minimum wage variable will be biased. Therefore, wherever possible I have controlled for time varying factors which have the potential to lead to endogeneity bias.

I was unable to obtain data for three important controls variables. I would have liked to control for provincial differences in the supply of schools, the direct cost of SS education and a proxy for the quality of education, such as the salaries of teachers or the student teacher ratio.

I am concerned that these variables are correlated with time varying unobservable factors which will determine enrolment rates or teenage employment rates and will lead to endogeneity bias. For example, if the minimum wage variable is positively correlated with the quality of education due to provinces with a higher cost of living having the ability to pay teachers more and equip schools with better resources, the coefficient on the minimum wage variable will again be biased upwards. The analysis would therefore be improved as a result of the inclusion of these additional controls.

An additional potential source of endogeneity is the minimum wage setting process itself. A key identifying assumption is that there are no time varying unobservables that are correlated with within-province changes in the minimum wage. The implication is that within-province increases in the

minimum wage were not caused by unobservable factors influencing local labour market conditions or local enrolment rates. If this assumption fails the estimates of equations (20)–(22) will be biased. Rama (2001) finds that labour market conditions (lagged changes in the provincial average wage and the provincial employment-to-population ratio) account for only a small share of variation in the minimum wage. I will further argue that the contemporaneous within-province variation in the minimum wage is not correlated to unobservable factors influencing the contemporaneous enrolment rate due to the time lag associated with the acquisition of human capital. Therefore, it is argued that the estimates are not biased by the endogeneity of the wage setting process.

As a result of the number of provinces in Indonesia the empirical estimation is carried out with only 26 or 34 clusters. Given the asymptotic justification of cluster-robust standard errors it is possible that the standard errors perform poorly due to the number of clusters being less than 42. Cameron et al. (2008) recommend using a bootstrap procedure to perform inference in such a situation. However, the wild bootstrap procedure was developed for the OLS estimator and it is not clear how it would perform with the FE-FGLS estimator used in the empirical analysis. Therefore, the clustered standard errors will not be altered.

6.3 Results

Table 1 presents the Effects GLS estimates of equations (20)–(22) for three time series. The estimates for the full 1990-2010 time period are found in column (1), the estimates for first decade, 1990-2000, are found in column (2) and estimates for the second decade, 2000-2010 are found in columns (3).

In panel A the dependent variable is the log of the odds ratio of the proportion of individuals in each province in school and not employed (SNE) compared to the proportion of individuals neither in school nor employed (NSNE). In the full time series the contemporaneous effect of the minimum wage is positive while the lagged minimum wage variable has a negative impact on the log odds ratio. The estimated coefficients on the minimum wage variables for the 1990-2000 series are negative indicating that the minimum wage raises the proportion of individuals in school relative to the proportion of individuals who are neither in school nor formally employed. In column (3) the contemporaneous minimum wage variable has a negative coefficient and the lagged minimum wage has a positive coefficient.

However, the contemporaneous minimum wage variables are only significant in the 1990-2000 series. From 1990-1995 the real minimum wage in 1000 Rupiah increased from 36.9 to 77.6 in the province of Jakarta. According to the estimate of column (3) this would have led to a decrease in the proportion of teenagers classified as SNE relative to the proportion of teenagers classified as NSNE by 28%, a large effect. In the province of Jakarta the real minimum wage rose from 47.7 to 57.6 (in thousand Rupiah per month) from 2000 to 2000.5. The positive coefficient on the lagged minimum wage variable in column (3) implies that the increase in the minimum wage would have caused the proportion

of teenagers classified as SNE relative to the proportion of teenagers classified as NSNE to increase by 7%.

Table 1: Log Odds Ratios of Equations (20)-(22)

	1990-2010	1990-2000	2000-2010
	(1)	(2)	(3)
<i>Panel A: Log(SNE/NSNE)</i>			
Real Minimum Wage	0.00361* (0.00208)	-0.00795** (0.00303)	-0.00344 (0.00425)
Lagged Real Minimum Wage	-0.00155 (0.00170)	-0.00254 (0.00278)	0.00673* (0.00377)
<i>Panel B: Log(ENS/NSNE)</i>			
Real Minimum Wage	-0.0136*** (0.00388)	5.49e-05 (0.00578)	-0.0144*** (0.00490)
Lagged Real Minimum Wage	0.00734** (0.00355)	-0.00566 (0.00366)	0.00623* (0.00361)
<i>Panel C: Log(SE/NSNE)</i>			
Real Minimum Wage	-0.0123 (0.00871)	-0.00585 (0.0208)	0.0710 (0.0652)
Lagged Real Minimum Wage	0.00641 (0.00829)	0.0159 (0.0106)	-0.0967* (0.0526)
JHS Made Compulsory in 1994 (Dummy)	Yes	Yes	No
Observations	387	174	192
Number of clusters	28	25	25

Notes: In all regressions the control variables described in section 6 are included - the relative size of the teenage cohort, the percentage of the population living in urban areas, the unemployment rate of prime age males, the percentage of women employed, the average number of household members per household, average real household monthly expenditure, average real monthly wage, the real total monthly wage and the degree of compliance. All columns include time dummies and province fixed effects. The estimates allow for different residual error variances across states, and AR(1) errors, with different autocorrelation parameters across states. Cluster robust standard errors clustered at the province level are reported under coefficient estimates. Significance at the 1 percent, 5 percent, and 10 percent levels are denoted respectively by “***”, “**”, and “*”.

Panel B presents the estimated coefficients of equation (21). The dependent variable is the log of the odds ratio of the proportion of individuals in each province employed but not in school (ENS) compared to the proportion of NSNE individuals. The statistically significant contemporaneous estimates in column (1) and column (3) indicate that the proportion of ENS teenagers fell relative to the proportion of NSNE teenagers from 2000 to 2010, while the positive lagged values offset this effect. A test of joint insignificance of the contemporaneous and lagged values is rejected at the 5% level in both time series, therefore the positive effect of the lagged minimum wage on employment does not entirely offset the negative contemporaneous effect. The estimated coefficients of the contemporaneous and

lagged minimum wage variables given the increase in the minimum wage in Jakarta from 2000-2005 imply a 6% decrease in the proportion of ENS teenagers to NSNE teenagers, a small effect on the odds ratio.

Panel C presents the estimated coefficients of equation (22). The dependent variable is the log of the odds ratio of the proportion of SE teenagers compared to the proportion of NSNE teenagers. The lagged minimum wage variable is negative and significant in the 2000-2010 time period, although only at the ten percent significance level. The estimated coefficient implies that the increase in the real minimum wage from 2000 to 2005 in Jakarta would have reduced the ratio of SE teenagers to NSNE teenagers by 62%. This is a very large effect, but is not unexpected given the small proportion of students classified as SE compared to NSNE.

Table 2 contains the estimates of equations (20) and (21) disaggregated by gender. The disaggregation does not reveal differences in the response of the occupational choice of females and males to the minimum wage variable. In Panel A the dependent variable is the log of the odds ratio of the proportion of individuals in each province in school and not employed (SNE) compared to the proportion of individuals neither in school nor employed (NSNE). The negative coefficient on the minimum wage variable in column (4) is larger in magnitude for the corresponding coefficient for females in column (3). The difference in the coefficients translates into a different of 4% between the

Table 2: Log Odds Ratios SNE/NSNE and ENS/NSNE Disaggregated By Gender

	1990-2010		1990-2000		2000-2010	
	Female	Male	Female	Male	Female	Male
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Panel A: Log(SNE/NSNE)</i>						
Real Minimum Wage	0.000352 (0.00211)	0.00253 (0.00214)	-0.00784* (0.00383)	-0.00993** (0.00363)	-0.00197 (0.00324)	-0.00438 (0.00340)
Lagged Real Minimum Wage	0.000184 (0.00179)	-0.00146 (0.00188)	-0.00536 (0.00401)	-0.00434 (0.00278)	0.00569* (0.00295)	0.00732** (0.00319)
<i>Panel B: Log(ENS/NSNE)</i>						
Real Minimum Wage	-0.0134** (0.00579)	-0.0143** (0.00551)	0.0116** (0.00542)	0.0137** (0.00568)	-0.00588 (0.00585)	-0.00812 (0.00605)
Lagged Real Minimum Wage	0.0129** (0.00624)	0.0121** (0.00572)	-0.00873 (0.00651)	-0.00681 (0.00613)	0.00455 (0.00414)	0.00382 (0.00379)
JHS Made Compulsory in 1994 (Dummy)	Yes	Yes	Yes	Yes	No	No
Observations	386	386	173	173	192	192
Number of clusters	28	28	25	25	25	25

Notes: In all regressions the control variables described in section 6 are included - the relative size of the teenage cohort, the percentage of the population living in urban areas, the unemployment rate of prime age males, the percentage of women employed, the average number of household members per household, average real household monthly expenditure, average real monthly wage, the real total monthly wage and the degree of compliance. All columns include time dummies and province fixed effects. The estimates allow for different residual error variances across states, and AR(1) errors, with different autocorrelation parameters across states. Cluster robust standard errors clustered at the province level are reported under coefficient estimates. Significance at the 1 percent, 5 percent, and 10 percent levels are denoted respectively by “****”, “***”, and “**”.

two genders in the fall of the proportion of SNE individuals relative to the proportion of NSNE individuals using the change in the real minimum wage in Jakarta between 1990 and 1995.

Panel B contains the estimates of equation (21). There appears to be no difference of the impact of the minimum wage on employment between females and males. For both genders the proportion of individuals ENS relative to NSNE rose from 1990-2000, but had a negative effect on employment over the time period 1990-2010. The lack of difference between genders of the effect of the minimum wage on occupational choice lends support to the assertion of Kevane and Levine (2003) that the gender bias in the intra-household allocation of educational expenditure in Indonesia had disappeared by the 1990s.

6.4 Interpretation of Results

As theorised the empirical results suggest that the economic impacts of the minimum wage differed between the two decades under consideration.

6.4.1 1990-2000

The empirical analysis implies that during the 1990s the sharp increase in the minimum wage had a negative impact on enrolment in SS and raised the proportion of the population neither in school nor in formal employment. The results suggest no impact of the minimum wage on the ratio of the proportion of employed teenagers nor on the proportion of teenagers employed and in school to the proportion of NSNE individuals during this time period.

The results imply that the sharp increase in the minimum wage during the 1990s led teenagers to forego further education in favour of queueing for formal sector jobs, working in the informal sector or working within the household. The direct increase in the wage of skilled labourers was offset by an increase in the expected wage of unskilled workers.

Suryahadi et al. (2003) found that in response to the sharp variation of the minimum wage during the early 1990s formal sector employers substituted low-skilled for high-skilled labour. Particularly susceptible to negative employment effects were young people, females and low-skilled labour, defined as having JS education or below. Furthermore, Figure 6 indicates that during the 1990s approximately 60% of workers employed in the formal sector had attended secondary high school, and less than 10% of workers had attended only junior secondary school. Given the low proportion of formal sector workers with a JS education and evidence of negative employment effects for young and low-skilled labourers, it is doubtful that teenagers chose to leave school aged 16 expecting to get a job in the formal sector. The minimum wage directly raised the wage of skilled workers which in isolation acts as an incentive to stay in education. Therefore, the negative impact on enrolment is indicative of a high expected unskilled wage as a result of a high probability of finding employment or wages close to the wage floor in the informal sector. It is plausible that as a result of the very high sustained economic

growth during the early 1990s there was a sufficiently high expectation of finding informal work that teenagers abandoned their education as opposed to queueing for jobs in the formal sector. However, this hypothesis is only tentatively proposed due to the fact that the data required to evaluate whether there was an expansion in informal sector employment or an increase in informal sector wages as a result of the sharp increase in the minimum wage is not available.

6.4.2 2000-2010

During the second decade under consideration the minimum wage reduced the proportion of teenagers in formal employment relative to the proportion of teenagers not in school or formal employment and there was a negative impact on the proportion of teenagers in school and in employment. The minimum wage also raised the proportion of teenagers enrolled in SS relative to the proportion of teenagers NSNE. This result is consistent with the minimum wage raising the skill premium sufficiently for teenagers to choose to remain in education instead of seeking employment at the age of 16.

Why did the minimum wage deter teenagers from remaining in school during the 1990s but act as an incentive to remain in education in the following decade? Figure 6 shows that the proportion of JS graduates in formal sector employment rose from 10% during the 1990s to approximately 17% in the following decade. This suggests that the incentive to leave education would have been higher during the 2000s compared to the 1990s because a higher proportion of JS graduates were able to earn the minimum wage in the formal sector.

However, the proportion of JS graduates eligible to receive the minimum wage through formal employment remains low. Furthermore, in the post-East Asian crisis decade of jobless growth youth unemployment remained high. Figure 7 shows that youth unemployment rose from 20% in 1999 to 33% in 2004, a considerable increase, and remained much higher than the unemployment rate of the population. The implication is that the expected unskilled wage fell sufficiently to raise the skill premium as a result of the low probability of unskilled workers obtaining employment in the formal sector and the informal sector. Overall, it is hypothesised that the employment prospects in the 2000s were sufficiently scarce that the direct impact of the minimum wage on the skilled wage led to an increase in enrolment.

6.5 Robustness Check and Sensitivity Analysis

In order to evaluate the sensitivity of the results to changes in specification I re-estimated equations (20)-(22). I removed the years of the South East Asian financial crash due to the high rate on inflation and sharp recession and I removed the lagged real minimum variable. The removal of the years 1997 and 1998 made no difference to the conclusions of the empirical analysis and in the interest of space the results are not reported. Table 3 contrasts the estimated coefficients with the lagged real minimum wage variable included in Panel A and omitted in Panel B. The removal of the lagged minimum wage

Table 3: Log Odds Ratios without Lagged RMW Variable

	1990-2000 SNE/NSNE	2000-2010 SNE/NSNE	1990-2000 ENS/NSNE	2000-2010 ENS/NSNE	1990-2000 SE/NSNE	2000-2010 SE/NSNE
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Panel A: Estimated Coefficients with Lagged RMW Variable</i>						
Real Minimum Wage	-0.00795** (0.00303)	-0.00344 (0.00425)	5.49e-05 (0.00578)	-0.0144*** (0.00490)	-0.00585 (0.0208)	0.0710 (0.0652)
Lagged Real Minimum Wage	-0.00254 (0.00278)	0.00673* (0.00377)	-0.00566 (0.00366)	0.00623* (0.00361)	0.0159 (0.0106)	-0.0967* (0.0526)
<i>Panel B: Estimated Coefficients with No Lagged RMW Variable</i>						
Real Minimum Wage	-0.00623** (0.00278)	0.00143 (0.00286)	-0.00560 (0.00491)	-0.0103** (0.00381)	0.00651 (0.0260)	0.0316 (0.0320)
JHS Made Compulsory in 1994 (Dummy)	Yes	No	Yes	No	Yes	No
Observations	150	195	119	156	155	239
Number of clusters	25	25	25	25	26	33

Notes: In all regressions the control variables described in section 6 are included - the relative size of the teenage cohort, the percentage of the population living in urban areas, the unemployment rate of prime age males, the percentage of women employed, the average number of household members per household, average real household monthly expenditure, average real monthly wage, the real total monthly wage and the degree of compliance. All columns include time dummies and province fixed effects. The estimates allow for different residual error variances across states, and AR(1) errors, with different autocorrelation parameters across states. Cluster robust standard errors clustered at the province level are reported under coefficient estimates. Significance at the 1 percent, 5 percent, and 10 percent levels are denoted respectively by “***”, “**”, and “*”.

variable does not alter the general result that the proportion of teenagers SNE relative to the proportion of teenagers NSNE fell in the 1990s and rose in the 2000s. However, the negative effect of the minimum wage in column (1) of Panel B is smaller in magnitude than that of Panel A and omitting the lagged real minimum wage variable leads to the coefficient for the 2000-2010 time period in column (2) losing significance. The implication is that the positive impact on enrolment is due to the lagged real minimum wage variable. The negative coefficient in column (4) of Panel B is also smaller in magnitude than that of Panel A but remains significant, whereas the coefficient in column (6) loses significance once only the contemporaneous minimum wage variable is included.

7. Conclusion

The sharp increase in the real minimum wage in Indonesia during the 1990s led to a fall in the proportion of teenagers enrolled in Senior Secondary School, whereas between 2000 and 2010 the rise in the minimum wage had a positive impact on the Senior Secondary enrolment rate. Estimates suggest that the increase in the real minimum wage in the province of Jakarta from 1990-1995 led to a decrease in the proportion of teenagers classified as SNE relative to the proportion of teenagers classified as NSNE by 28%. However, from 2000-2005 the increase in the minimum wage is estimated to have caused the proportion of teenagers classified as SNE relative to the proportion of teenagers classified as NSNE to increase by 7%. The effect of the minimum wage on the occupational choice of teenagers does not differ according to gender.

The results suggest that there is a relationship between the minimum wage and the secondary enrolment rate. Using a simple model of household investment in education it is shown that the minimum wage influences household decisions of investment in education through its impact on the wage premium. In the context of Indonesia, during the 1990s only a small fraction of the formal labour force had a Junior Secondary education, which implies that the direct effect of the minimum wage would have been to raise the Senior Secondary enrolment rate due to an increase in the skill premium. The theoretical implication is that during the 1990s the economic expansion of Indonesia led to an increase in the expected wage of unskilled workers through employment opportunities in the informal sector and the proximity of the informal sector wage to the wage floor which raised the unskilled wage sufficiently to reduce the skill premium. This hypothesis cannot be confirmed due to a lack of data concerning the informal sector wage distribution and employment rate, therefore it is offered tentatively. Conversely, the rise in the Senior Secondary School (SS hereafter) enrolment rate during the 2000s in response to the rise in the minimum wage implies that the direct effect of the minimum wage on skilled wages was sufficient to encourage individuals to remain in school.

Given that the difference in employment prospects and wages in the informal sector is offered as an explanation for the difference in the effect of the minimum wage on secondary enrolment rates across the two decades under consideration, the results of the empirical investigation indicate that the impact of the economic climate on the human capital investment decision of teenagers should be taken into consideration when considering the costs and benefits of introducing or raising the minimum wage. Policy interventions may be required to encourage teenagers to finish secondary school to offset the negative effect of the minimum wage on the secondary enrolment rate and to avoid the negative repercussions in terms of long-run economic development of a labour force with low levels of human capital.

The explanations offered for the change in the impact of the minimum wage in Indonesia over time are hypothetical. Therefore, future research could focus on unravelling the indirect channels through which the real minimum wage impacts on decisions of occupational choice. As a result of the differences in the economic context across developing countries I believe it would also be informative to conduct the empirical analysis undertaken in this study in different developing countries.

Appendix:

Derivation of equation (8):

$$U(s_i = 0 \mid y_i, \theta_i) < U(s_i = 1 \mid y_i, \theta_i)$$

It follows that:

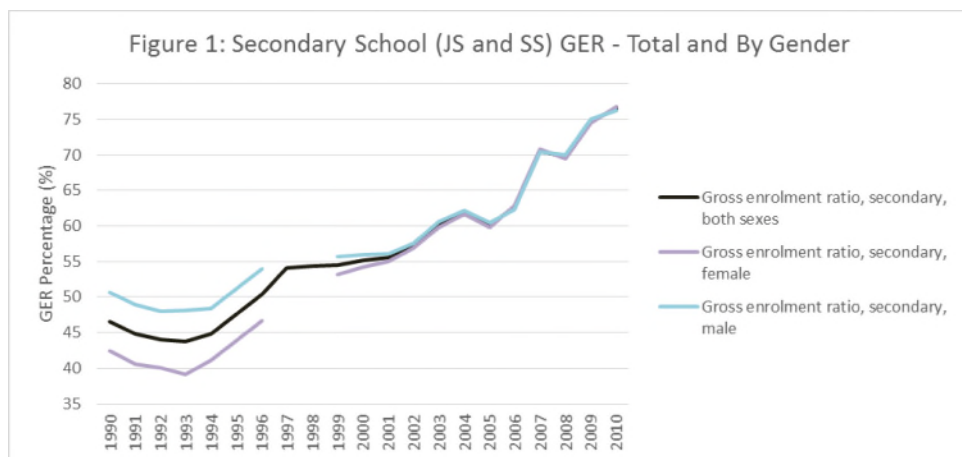
$$\ln(y_i) + \ln(w_u) < \ln(y_i - \theta_i) + \ln(w_s)$$

Solving for θ_i , the cost of education:

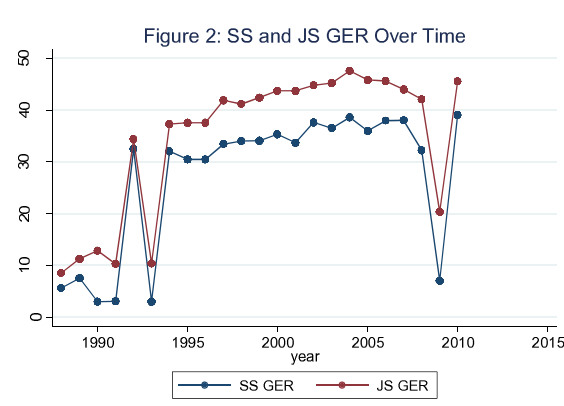
$$y_i w_u < (y_i - \theta_i) w_s$$

$$\frac{y_i(w_s - w_u)}{w_u} \geq \theta_i$$

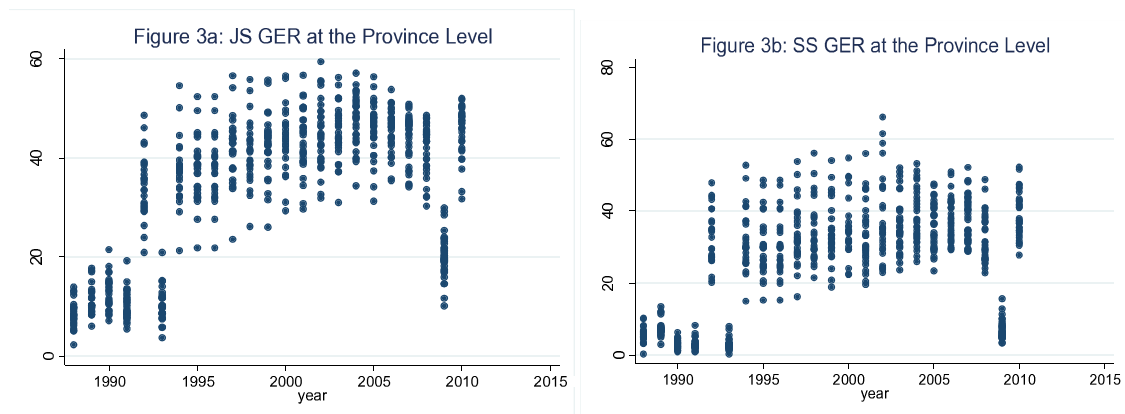
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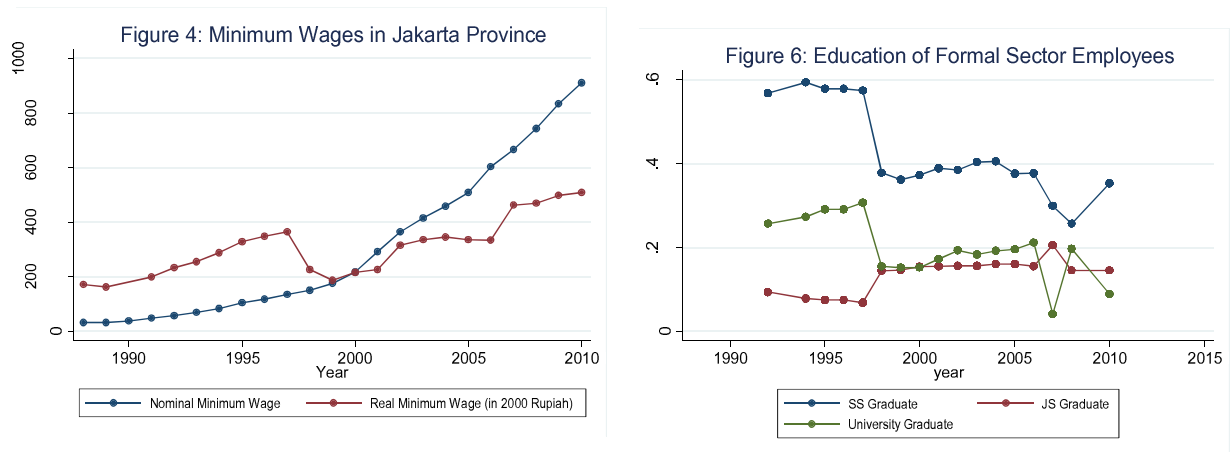
Source: *World Development Indicators 2016, World Bank*



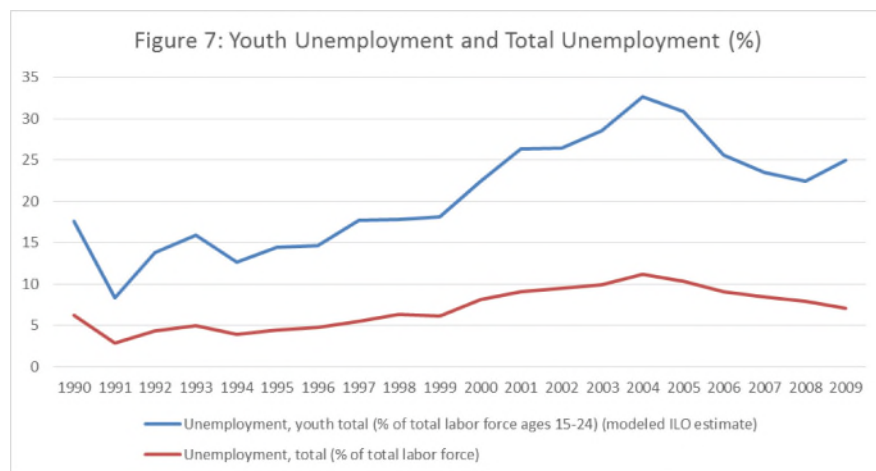
Source: Sakernas and Susenas Household Surveys



Source: Sakernas and Susenas Household Surveys



Source: BPS Indonesia and Rama (2001) Source: Sakernas and Susenas



Source: World Development Indicators 2016, World Bank

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