論 説

The Effect of Minimum Wages on Teenage Employment and School Enrollment in Indonesia

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Abstract

Using the Indonesia Family Life Survey 5 (IFLS5) survey in 2013 and 2014, this study examines whether minimum wage increases affect employment and school enrollment for teenagers aged 15–19 years in Indonesia. Three different specifications for the minimum wage measurement in the Difference-in-Difference estimates, and a lagged effect of minimum wage increases in the Fixed-Effects estimates are employed in an attempt to reconcile the results of the two approaches. The Difference-in-Difference approach with 'fraction below' and Fixed-Effects approach with a one-year lag of the relative minimum wage are the preferred specifications because the main consideration in this study is the low compliance with minimum wage laws in Indonesia. We find a disemployment effect of minimum wage increases and no enrollment effect. The disemployment effect indicates somewhat binding minimum wages, in spite of non-compliance. These findings suggest that the disemployed teenagers contribute to the increases in the proportion of teenagers becoming idle after minimum wages are raised.

JEL Classification: J08, J46, J88, O53

Keywords: Indonesia, employment, minimum wage, school enrollment, teenagers

1. Introduction

There is little need of schooling when there are high minimum wages. Compared to adults, many teenagers, when entering the labor market, have less skill and experience. Both of these attributes consign them to the low-wage group, which is the most sensitive

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group to minimum wage changes. Higher minimum wages, assuming they are effective, might encourage some teenagers to work to take the opportunity of earning higher wages, but it might instead discourage them if higher minimum wages reduce their employment opportunity. For many teenagers, however, working and schooling represent alternatives (Neumark and Wascher, 1992). They face a trade-off between time and effort spent on school or in the labor market.

Indonesia is an interesting case for studying the effect of minimum wages on employment and school enrollment for at least two reasons. First, the variation in wages after an increase in provincial minimum wages in Indonesia provides a natural experiment, as suggested by Card (1992). Second, the country is expected to have a demographic bonus or dividend between 2020 and 2030, which means the productive age population between 15 and 64 years old will be at the maximum point relative to older and younger cohorts (Hendratno, and Fitriati, 2015). This bonus might provide extensive labor supply at productive age as a factor input of economic growth. However, instead of a dividend, the increasing number of this age group might burden the nation if the labor supply is less productive as a result of teenagers dropping out early from the education system.

This study attempts to answer the following questions. What is the effect of minimum wage increases on teenage employment? Is there any lagged effect of minimum wage increases in Indonesia? Can we reconcile the different approaches in minimum wage literature, particularly for measuring the employment effect? What is the effect of minimum wage increases on school enrollment and is there any substitution effect?

For these purposes, the empirical strategy of this study follows previous studies that focus on minimum wage increases at the sub-national level (provincial level) and that take into consideration non-compliance with the minimum wage laws. The definition of non-compliance in this study is a condition in which some firms both in the covered and uncovered sectors set their wages below the minimum wage. The proportions of workers below the new minimum wage are calculated for distinguishing the treatment and the control groups. These groups are then used for estimating the effect of minimum wage increases with a Difference-in-Difference approach. The Fixed-Effects methodology equipped with the one-year lag of the minimum wage is also employed in an attempt to reconcile the two strands of the previous literature.

The sample in this study is drawn from the fifth wave of Indonesian Family Life Surveys (IFLS5) which was conducted in 2014. The data allow us to construct a panel of two adjacent years 2013 and 2014. Teenagers in this study describe individuals age 15–19. Employment in this study is defined by the individual's primary activity during the previous week, employed or not employed, while enrollment is the schooling status of individuals. Additional data is taken from Statistics Indonesia-BPS to construct the relative minimum wage, the employment rate and the unemployment rate.

The contribution of this study to the minimum wage literature is as follows. First, there is a lack of minimum wage studies in Indonesia focusing on teenagers' schooling decisions, and this study fills that gap. Second, this study employs both the Difference-in-Difference, and Fixed-Effects approaches to estimate the effects of minimum wage increases on employment and school enrollment. Third, previous studies of the effect of minimum wage increases on enrollment in developing countries used national or zone minimum wages, while this study estimates the effects of provincial minimum wages.

Similar results using Difference-in-Difference with 'fraction below' and Fixed-Effects approach in specifications using a one-year lagged minimum wage are found in this study. Using Difference-in-Difference with the preferred specification — 'fraction below' — this study finds a disemployment effect but no effect on school enrollment for teenagers in Indonesia. Another empirical approach in this study is the Fixed-Effects. The ratio of the minimum wage to the average wage is used for this approach. Using the one-year lag of the relative minimum wage — the preferred specification — the study finds a disemployment effect and no evidence that an minimum wage increases alter school enrollment. The findings indicate that some teenagers who are disemployed as a result of minimum wage increases become idle rather than returning to school, suggesting an increase in the proportion of teenagers neither in school nor enrolled.

In the next section, this paper briefly discusses the minimum wage legislation in Indonesia. It is followed by a broader literature review. The third section describes the data used, and presents empirical strategy and specification. The fourth section reports and discusses the empirical results. This paper will be closed by concluding remarks on policy implications.

2. Literature Review

2.1 Minimum Wages in Indonesia

It has been a long-stranding consensus that minimum wage legislation in developing and developed countries have different characteristics. The most notable differences are in coverage and compliance. In many developing countries, the law does not cover all the workers in the economy, mainly because many of them work in the informal sector. Furthermore, some firms within the covered sector prefer not to comply with the law. Some facts about the minimum wage in Indonesia are elaborated in this section.

Indonesia has a long historical experience of minimum wages. Legal minimum wages were first introduced in 1970 for urban workers and set by the Ministry of Manpower (Del Carpio et al., 2012). At that time, the law only existed for cosmetic purposes, because it was neither enforced nor set properly. The Indonesia government began to actually en-

force the minimum wage law and to raise it in the 1990s (Chun and Khor, 2010). Between 1990 and 1997, minimum wages doubled in real terms (Magruder, 2013).

In 2001, the decentralization policy was enacted and the minimum wage legislative authority was transferred to the provincial level by the 2003 Laws on Manpower Affairs regulation. It is different from other developing countries, such as Brazil in which the national government has the authority to set the law (Rani et al., 2013). Indonesia has a hybrid minimum wage legislation, which is regulated at the provincial level. Each province enacts its own minimum wage law, which empowers the governor to set minimum wages at a regional level determined through a collective bargaining process, including government, labor unions and firms. Some of the provinces arrange district, and sectoral level minimum wages, with a requirement that they must be above provincial minimum wages. Those minimum wages are set based on the basic needs of subsistence and by considering economic growth. It is enacted once a year and effective on the 1st of January without any adjustment in the same year.

Many institutions in the country continually support minimum wage increases. The first pressure comes from protests by labor unions (workers strikes) in support of higher minimum wages. Union members are the major proponents of an increase because it could indirectly increase their wages. The protests have additional fuel from Non-Government Organizations and journalists (Sukatrilaksana, 2002). Being representatives of political parties, most of the government officials are support side of minimum wage increases, which may be related to election campaigning. On the other hand, firms clarify their position against the increase by proposing to move their firms to another province or even to other countries with lower standard wages. Some of them argue that minimum wage increases might put higher pressure on their profit and production.

Minimum wages apply only to employed workers. Similar to many other developing countries, the informal sector in Indonesia is not covered by the minimum wage law (Hohberg, 2015). In 2014, the ILO estimates that 60 percent of workers from the total employment are self-employed in Indonesia while Magruder (2013) suggests that self-employed workers are mostly in the informal sector and are not likely to be covered by the minimum wage law. That a large proportion of workers are self-employed indicates that the law covers only a small fraction of workers in the economy. In addition, Pratomo (2016) suggests that more than 50 percent of teenage workers earn less than minimum wages.

Compliance with the law is low. Even after the law is in effect some firms choose not to comply with it. From 2008 to 2013, non-compliance fluctuated about 40 percent before having a sharp increase above 50 percent in 2014 (Allen, 2015). In general, there are several reasons for this low compliance. First, the law is not properly enforced, probably because of a lack of resources and under-staffing of government authorities. Even among provinces there are variations in enforcement (Chun and Khor, 2010). Second, unlike some developed

Table 1. Provincial minimum wages in 2013 and 2014

Provinces	2013	2014
Sumatera Utara	850,000	1,000,000
Sumatera Barat	1,181,000	1,542,600
Sumatera Selatan	947,114	988,500
Lampung	1,337,500	1,620,000
DKI Jakarta	866,250	1,000,000
Jawa Barat	830,000	910,000
Jawa Tengah	1,375,000	1,505,850
DI Yogyakarta	1,350,000	1,490,000
Jawa Timur	2,200,000	2,441,000
Bali	1,440,000	1,800,000
Nusa Tenggara Barat	1,630,000	1,825,000
Kalimantan Selatan	1,100,000	1,210,000
Sulawesi Selatan	1,150,000	1,399,037

Note: The value is in nominal term and IDR. This table only presents 13 provinces out of 33 provinces in Indonesia.

countries with unemployment benefit policies, in Indonesia such a system is absent. In addition, labor unions which are expected to watch out for workers' interests, only follow the process of enacting the law, not its implementation.

The arrangements have led to a variation in minimum wages across the provinces in Indonesia (Magruder, 2013). Provincial minimum wages between 2013 and 2014, the years observed for this study, were raised in all the provinces in Indonesia. The percentage increase varied from 4.37 percent in DI Yogyakarta to 30.62 percent in Bali. The national average of the minimum wages was raised by 22.2 percent in nominal terms in the same year. This substantial variation provides a natural experiment for extending the literature of the minimum wage effect on employment and school enrollment, as suggested by Card (1992).

2.2 Employment Effect

Some previous studies take advantage of the minimum wage variation across regions after minimum wage increases to analyze its effect on teenage employment. The seminal study by Card (1992) takes this approach, using the US data. He suggests that some workers have a higher probability than others of being affected by minimum wage, and each region might have a different proportion of these affected workers. These proportions can be used to differentiate regions, which are more likely to be affected by the treatment — minimum wage increases. One of his approaches is to aggregate the states with similar fractions of affected workers in order to generate a large sample size. Card finds no evidence on disemployment effect.

Some other early empirical studies of minimum wages and employment extend the two techniques proposed by Card (1992) by adopting an approach that is commonly known as

Difference-in-Difference. The most influential studies using this approach are Katz and Krueger (1992) and Card and Krueger (1994). Katz and Krueger (1992) analyze the employment effects of the federal minimum wage increase in the Texas fast-food industry in 1991. They conduct a survey before and after the minimum wage increase. The study finds that higher minimum wages induce an increase in employment in the fast-food industry. Following the Katz and Krueger (1992), Card and Krueger (1994) analyze the employment effect of the minimum wage increases on the fast-food restaurant in New Jersey and Pennsylvania. They extend the coverage of the survey by including samples from the states with and without minimum wage increases. The study finds minimum wage increases do not decreases employment.

Although studies that use the Difference-in-Difference approach have made significant contributions to the literature on employment effects of minimum wage increases, they have also been challenged. These studies have been contested because of their arguments, their data, their methods and approaches (Edagbami, 2016). The most influential of these criticisms is the seminal research by Neumark and Wascher (1992). They argue that the data used by Card (1992) are biased because the after-treatment data were collected right after minimum wages were raised, and this wage floor was likely to affect workers with a lag of at least one year after its introduction. Furthermore, Neumark and Wascher (1992) suggest that there is heterogeneity in local labor market conditions, which could be captured by adding time and state dummies. Using the canonical Fixed-Effects approach and the US data for the overall labor market, they find a disemployment effect of minimum wage increases. These two strands of research are recognized as the "New Minimum Wage research" and they are still growing.

In recent studies, the Difference-in-Difference approach has been applied to natural experiments in which treatment and control groups can be identified better. Brewer et al. (2015) compose a treatment group consisting of individuals with wages between the old and the new minimum wage, while the control group includes individuals with wages near the new minimum wage. Another study uses regional variation in wage distribution after minimum wage hike. Stewart (2002) measures the fraction of workers with wages below the new national minimum wage in the UK. Regions with a relatively high and low proportion comprise the high-impact group and low-impact group respectively. In another recent study, Sabia et al. (2012) extend the natural experiment concept by constructing a synthetic group which is generated by weighting some observable economic conditions in a way that it resembles the treatment group but does not have the treatment. However, the last approach would require some extensive data on economic conditions.

The canonical Fixed-Effects approach has also been widely used by many researchers, employing region and time dummies and the unemployment rate, to control for labor-market condition (Allegreto et al., 2011). The common issue in this approach is how to con-

struct the minimum wage variable. Montmarquette (2007) uses the real minimum wage. However, constructing such a real minimum wage variable is problematic if regional-level price data is lacking. Neumark and Wascher (2007) suggest that the ratio of the nominal minimum wage to the national average wage could measure the real minimum wage differences across regions in the absence of state-level price data. This relative value of minimum wage could also measure the degree to which workers earn market wages above the minimum wage and who might be substituted for minimum-wage workers.

In Indonesia, using an individual-level analysis, Pratomo (2016) finds a decrease in the probability of teenagers being employed in the covered sector. He further suggests that some teenagers shifted from the covered sector to the uncovered sector. Using a logarithm of the real minimum wage and degree of compliance variables as well as province and year dummies, Suryahadi et al., (2003) find a disemployment effect for youth working in the urban formal sector with 0.3 of elasticity. Furthermore, they suggest that in general the labor market in Indonesia is competitive. Many minimum wage studies in Indonesia analyze the employment effect, but the school enrollment effect is often overlooked.

In fact, most studies of the effect of minimum wage increases on teenage employment argue that they have their own particular approach, but most of them use either the Difference-in-Difference or Fixed-Effects approaches. Neumark and Wascher (2007) suggest that both approaches used in the initial round of 'new minimum wage studies' were valid, and that their different results are primarily attributable to which groups were being analyzed. Allegretto et al. (2011) also suggest that the conflicting findings between these two strands of research may be driven by the difference in groups and in data being studied. In this study, the Difference-in-Difference and Fixed-Effects approaches will both be used to analyze the effect minimum wage increases on employment and on school enrollment.

2.3 School Enrollment Effect

The effect of minimum wage increases on schooling decision is often overlooked by researchers. This is surprising, because schooling is considered to be human capital investment for future earning, and minimum wage increases may have an undesirable effect of discouraging such investment. Wilson et al. (2005) suggest that the schooling decisions of teenagers could be influenced by an economic incentive such as minimum wages. Minimum wage increases might drive teenagers to drop out of school and enter the labor market to work at the now higher wage (Montmarquette, 2007). It might be true if students think only about the short term and myopically respond to improving labor market opportunities (Chaplin et al., 2003). However, if they are more concerned about longer-run job opportunities and improving their prospects for higher wage jobs, higher minimum wages might induce teenagers to remain in school (Campolieti et al., 2005).

Neumark and Wascher (1995a) present an additional hypothesis related to how minimum

wage increases affect employment and schooling decisions. The hypothesis is that some teenagers will withdraw from school and enter the labor market to replace the less productive teenage workers who are disemployed when minimum wages are raised. However, it may be questioned whether firms would think out-of-school teenagers as highly productive workers. Campolieti et al. (2005) argue that firms might be averse to employing school dropout teenagers given the signal that they are amenable to leaving school to work. The empirical evidence supporting these hypotheses is mixed. Some studies find that teenage workers quit school to take minimum wage jobs (Neumark and Wascher, 1995b; 2003), while Campolieti et al. (2005) find no substitution between schooling and minimum wage employment.

Some studies conclude that there was an increase in the proportion of teenagers being idle (neither in school nor employed). The increase is associated with the disemployed teenage workers and the school dropouts (Neumark and Wascher, 1995b: 2003). However, Turner and Demiralp (2001) find a decrease in the proportion of teenagers being idle. Indeed, this analysis becomes more complicated when we consider the uncovered sector and the presence of non-compliance in the covered sector. It is not clear whether teenagers will drop out of school and start to search for work when minimum wages do not represent market wages. The certainty of the prediction is even more complicated if raising minimum wages reduces employment opportunities for teenagers, and some disemployed teenagers might find themselves being in the margin of decision, whether to enroll in school, to shift to the uncovered sector or to remain idle and to queue for minimum wage jobs.

Empirical studies on this issue in developed countries yield mixed findings even within the same country under study. Pacheco et al. (2007), using New Zealand data, find that higher minimum wages decrease school enrollment for teenagers aged 16 to 19 years old. Several studies using United States data have different findings. Using 1989 and 1990 of the United States data, Card (1992) finds no evidence that minimum wage increases alter school enrollment. Chaplin et al. (2003) find that minimum wage increases in the United States decrease school enrollment in states where the legal age to drop out is less than 18. They suggest that other policies might offset this unintended effect to encourage teenagers to continue in school.

Notwithstanding the benefit of these studies, economics of minimum wages in developed countries and in developing countries is different. In many developing countries, a large fraction of workers is in the informal sector which is not covered by the minimum wage law (Hohberg, 2015). In the formal sector, the enforcement of the minimum wage law and compliance with it are a concern (Neumark and Wascher, 2007). These labor-market characteristics suggest that minimum wage legislation might have different effects in developing countries. Neumark and Wascher (2007, p. 162) acknowledge that research on the ef-

fects of minimum wage increases in a developing country such as Indonesia could be especially enlightening because of minimum wage increases in reality and the availability of data.

Until recently, there is little research on the effect of minimum wage increases on teenage employment and schooling in developing countries. Using the Difference-in-Difference approach, Bakis et al. (2015) analyze the enrollment effects of minimum wage increases in Turkey.[1)] The specification is based on regional variation in wages to choose the affected group. They identify the percentage of people earning below minimum wages in each region and aggregate the top three regions as the low-impact group. The study finds a decrease in employment and an increase in school enrollment after minimum wage increase, suggesting that teenagers reduce their participation in the labor market and enter the schooling system. Another study on a developing country conducted by Perova, and Trujillo (2015) about Mexico also takes the Difference-in-Difference approach. They analyze formal workers earning between the old and new minimum wages in each zone and identify municipalities with an increase in minimum wage as the high-impact group. They find no impact on average school attendance.

While these previous studies extend the minimum wage literature, caution is needed before adopting a similar approach. The details have to be adjusted depending on specifics of the minimum wage law and the incidence of non-compliance in each country. Following the arguments and empirical approaches of the previous studies, we use both Difference-in-Difference and Fixed-Effects approaches based on province-level variation in wages in Indonesia, where minimum wages are set at the provincial government level annually. This study can contribute to the debate about the effect of minimum wage increases on teenage employment and school enrollment, especially in developing countries.

3. Empirical Strategy

3.1 Data

This study relies on the fifth wave of the Indonesian Family Life Survey (IFLS5) longitudinal survey by the Indonesian government. IFLS5 was implemented by the end of 2014, covering 13 of 33 provinces in Indonesia: Sumatera Utara, Sumatera Barat, Sumatera Selatan, Lampung, DKI Jakarta, Jawa Barat, Jawa Tengah, DI Yogyakarta, Jawa Timur, Bali, Nusa Tenggara Barat, Kalimantan Selatan, Sulawesi Selatan South. IFLS5 has two specific advantages for this study. First, it can be constructed for panel data analysis in two adjacent years: 2013 and 2014. Second, IFLS5 allows us to merge individuals and their parent's characteristics to construct the parents-education variable.

Particularly for the Difference-in-Difference approach, the regional wage variations in

each province prior to treatment need to be obtained for identifying treatment and control groups before estimating the effect of minimum wage increases on teenage employment and enrollment. Samples maintained are all adults, 15 years of age and above who are employed in 2013. Self-employed Individuals are removed from observation considering that minimum wages only affect employed workers. This selection produces a sample of 12,425 observations that reported their wages in 2013 with merely 2.3% of the missing value.

To make comparisons that match minimum wages, wages data should be calculated based on monthly rates. The 2014 monthly wages are available in IFLS5. However, the monthly wages for 2013 are not available. The data that can be retrieved from the survey was the yearly wage. To overcome this difference, we divide the annual wage by twelve months. The IFLS5 wage data is then paired with the provincial minimum wage of Statistics Indonesia-BPS by using the official province code of BPS to establish a group identification data set. Monthly wages and minimum wages are used to determine treatment groups and control groups.

Most previous studies examine teenagers at the age group of 16-19 years old as nearly all surveys collect the employment status of individuals at the age 16 and above (Turner and Demiralp, 2001). In this study, both using Difference-in-Difference, and Fixed-Effects, the age group selected is teenagers with the age of 15-19 years. Because the unemployment and employment data are based on this particular age group, and IFLS5 collected employment and school enrollment data for individual's age 15 and above.

The outcome variables of this analysis are teenage employment and school enrollment. The employment variable is constructed based on the individual primary activity during the past week. This data is preferred because individuals who think of working as their main activity would consider any minimum wage changes as part of their working decision. The enrollment variable is constructed based on the individual activity reported in each observation year. Individuals who answer "do not know" in the survey are considered missing values together with the actual missing values in creating panel data.

Additional data for provincial minimum wages, average wages, prime-age unemployment and teenage population are all collected from Statistics Indonesia-BPS. As for the variable of minimum wages, the relative nominal minimum wage compared with the average wage is employed since the provincial price data for constructing real minimum wages are unavailable. The unemployment rate and employment-to-population variables according to specific age groups and provinces are calculated using the projected population.

3.2 Difference-in-Difference Approach

3.2.1 Model

The first empirical strategy of this study is to estimate the effect of minimum wage increases on employment using Difference-in-Difference specification. Following Bakis et al.

(2015), the model is specified as follows.

$$y_{ipt} = \beta_1 \lambda_t + \beta_2 I_p + \beta_3 \lambda_t * I_p + \beta_4 \cdot unemp_{pt} + \beta_5 X_{ipt} + \epsilon_{ipt} \quad (1)$$

Where y_{ipt} is the outcomes of individual i at time t in province p for the employment outcome equal to one if a respondent status is employed and zero otherwise. λ_t takes the value of 1 for the years after minimum wages are raised (2014) and is zero otherwise (2013). I_p is equal to 1 for the high-impact (treatment) group and 0 for the low-impact (control) group. β_3 is the coefficient of interest which represents the effect of minimum wage increases, captured by the interaction between two dummies λ_t and I_p. $unemp_{pt}$ is the adult unemployment rate (age 20–59) in province p and time t. X_{ipt} denotes a set of control variables including age, gender, the share of teenagers out of population, urban, and parents' education. The equation (1) is continued to be used for estimating the school enrollment effect. In the model, y_{ipt} denotes the teenagers' outcomes i at time t in province p which is equal to one if a respondent status is enrolled (or stays enrolled), and zero otherwise. The control variables include marital status variable and other variables similar with the employment regression.

This study uses the simplest setting of two groups and two time-periods for the Difference-in-Difference approach. Both groups were exposed by the treatment of minimum wage increases. However, one of the groups has more individuals affected by the treatment or the treatment group (Stewart, 2002). Whereas, the control group has fewer individuals who tend to be affected by the law. The identification of the affected proportion individuals is done using the earnings of employed workers and the level of minimum wages in each province. The general assumption of Difference-in-Difference approach that the trend will remain the same in the absence of minimum wage changes seems to apply in Indonesia due to inadequate planning and targeting (Magruder, 2013).

3.2.2 Groups Identification Framework

For group identification, the income effect framework in which the law altered income generated by family members is used because we are not only analyzing the employment effect but also the school enrollment effect. Chaplin et al. (2003) suggested that the minimum wage may have an income effect. If education is a normal good, minimum wage increases may increase school enrollment if it increases household income, or it can do the opposite if it reduces income through the employment opportunity. Within this framework, school decisions are considered a family decision not just a teenager's decision. A factor to be considered in the decision-making is financial ability of the family to finance education. In Indonesia, inability to finance education is a significant reason for school dropouts (Suryadarma et al. 2006).

Family income of more than one family member is generated by wages, which may

change depending on minimum wages. In developing countries, it is common to have more than one family member working and generating income. Raising minimum wages for workers with wages less than a new minimum can result in higher wages or disemployment. Household income will increase if at least one of the household members gets a wage increase. However, it could do the opposite if a family member becomes unemployed. Considering that many teenagers are likely to live as dependents of their adult family members within the same province, then the proportion of all adults, 15 years of age and above, in each province who are likely to be affected by minimum wage increases in each province could constitute a treatment group for measuring the possible effect of minimum wage increases on teenage employment and school enrollment.

3.2.3 Specifications

This study uses three different specifications: 'fraction affected', 'fraction at' and 'fraction below' for the group identifications. The identification depends on the proportion of workers likely affected by minimum wage increases in each province. Card (1992) suggests that 'fraction affected' provides a way to capture the effect of minimum wage increases using the regional variation in wages. However, Lemos (2004) argues that 'fraction affected' is less reliable because it measures the potential effect and does not fully capture the minimum wage effect and spillover. Other variables that measure the degree of minimum wage impact is 'fraction at' and 'fraction below'.

Lemos further points out that 'fraction at' measures the binding of the minimum wage when it is increased while the 'fraction below' specification provides a wider range of groups likely to be affected by an minimum wage increases. The 'fraction below' specification captures the workers below the new minimum wage taking into account the non-compliance and spillover of the minimum wage. Although we estimate the effect of minimum wage increases using these three specifications, 'fraction below' is considered a preferred specification in this study. This is because, as is the case with many other developing countries, Indonesia has much non-compliance with minimum wages.

Following the Card (1992) and Lemos (2004) arguments, the percentage of workers likely to be affected by the minimum wages in each province is employed for constructing the control and treatment groups. Card (1992) proposes 'fraction affected' as the proportion of workers receiving the wages between or equal to the old and new provincial minimum wages, which in this study are defined as minimum wages in 2013 and 2014 respectively ($MW_{2013} \leq W_{2013} \leq MW_{2014}$). These measurements are used in addition to 'fraction below' and 'fraction at' as suggested by Lemos (2004). 'Fraction below' captures the fraction of employees with the 2014 wages below the 2014 minimum wages ($W_{2014} < MW_{2014}$), while 'fraction at' measures the fraction of employees with the 2014 wages near the 2014 minimum wages ($0.98MW_{2014} \leq W_{2014} \leq 1.02MW_{2014}$).

After defining the percentage of employees likely affected by minimum wage increases

in each province, the sample of teenagers belonging to the top and bottom for provinces in the list are aggregated and defined as the control and treatment group respectively for defining the group variable in the equation (1).

3.3 Fixed-Effects Approach

3.3.1 Model

The second empirical strategy uses the Fixed-Effects approach with province and time dummy variables. Following Neumark (2001), the baseline specification is:

$$Y_{ipt} = \beta_1 MW_{pt} + \beta_2 unemp_{pt} + \beta_3 X_{ipt} + \emptyset_p \tau_t + \varepsilon_{ipt} \quad (2)$$

Where Y_{ipt} is a dichotomous measurement of teenage employment taking the value one if the teen is working. $unemp_{pt}$ denotes the adult unemployment rate. $\emptyset_p$ and τ_t represent dummy variables of provinces and time respectively. The unemployment rate as well as the province and time dummy variables are expected to control the heterogeneity in the teenage labor market. X_{ipt} denotes the explanatory variables similar with the Difference-in-Difference approach. The parameter of interest is β_1 capturing the effect of minimum wage increases on employment. The provincial minimum wage variable is represented by $MW_{pt.}$ For the school enrollment effect, y_{ipt} denotes as the teenagers' outcomes which is equal to one if a respondent status is enrolled (or stays enrolled), and zero otherwise.

3.3.2 Specifications

The minimum wage variable is defined with three specifications. Neumark and Wascher (2007) suggest that, in the US, the relative value of the nominal minimum wage to the average wage could measure the real minimum wage differences across the country when state-level price data are unavailable. This relative minimum wage accounts for the spillover of the minimum wage up to the average wage (Lemos, 2004). In the first specification, the minimum wage variable is defined as the ratio of the nominal minimum wage at time t to the average wage at time t.

However, Neumark and Wascher (1992) note the importance of employing lagged effects of the minimum wage, to account for the possibility of longer periods before a change in the minimum wage affects employment. Firms might attempt to adjust to an increase in the wage floor through different channels before inducing disemployment. The inclusion of the lagged minimum wage tends to generate a stronger disemployment effect (Neumark, 2001). From a different perspective, in the presence of non-compliance with a somewhat binding minimum wage, firms might increase wages below the current minimum wage but higher than the previous minimum wage. A somewhat binding minimum wage distorts the wage distribution but might not be at the market wage floor (Cunningham, 2007). Although it is an empirical question, measuring the minimum wage effect excluding the possibility of lagged effect in an economy with non-compliance issues, might result in estima-

tion that is close to zero.

This lagged effect might occur in the Indonesia case because the regulation allows firms to postpone applying the law after it was enacted and there is also a non-compliance issue to take into account. In the next specification, the minimum wage variable is defined with some consideration of a lagged effect. The ratio of the nominal minimum wage in time $t-1$ to the average wage in time $t-1$ is used in the second specification. In the third specification, both the relative values of the minimum wage in the current year and one-year lag are included in the model.

4. Results

4.1 Difference-in-Difference Approach

4.1.1 Group Identification

Before turning to the empirical estimation using the Difference-in-Difference approach, the proportion of workers, age 15 and above, likely affected by the minimum wage in each province needs to be calculated using the three different specifications. Table 2 reports the fraction of employees receiving wages below the 2014 provincial minimum wage.[2)] Although it is tempting to compare the effect of minimum wages in extreme cases such as DI Yogyakarta with Lampung, Card (1992) states that areas with similar percentages may be aggregated to produce a relatively large sample size. Aggregation can be discontinued when it reaches a similar number of samples between the treatment group and the control group. Bakis et al. (2015) proposed this technique in their study.

Considering this approach, the four provinces at the bottom and top of the table is selected as the treatment and the control group respectively while the rest of the provinces are excluded from the sample. This process, shown in Table 2, results in a control group consisting of individuals living in DI Yogyakarta, Jawa Barat, Jawa Tengah, and Jawa Timur Provinces, while the treatment group consists of those living within the province of Sulawesi Selatan, DKI Jakarta, Nusa Tenggara Barat, Sumatera Selatan, Lampung. The group identification is then used as new information for estimating the effect of minimum wage increases on employment and school enrollment in the Difference in Difference approach.

4.1.2 Employment

Table 3 shows results of the Difference-in-Difference specifications with three different minimum wage measurements on the effect of minimum wage increases on teenage employment. In the top panel, the estimation result of β_3 in equation (1) shows the effect of minimum wage increases on teenage employment. The measure using 'fraction below' (column 1), appears to have the strongest disemployment effect as it generates a significant

Table 2. 'Fraction below' in each province

Provinces	Percentage
DI Yogyakarta	40.94
Jawa Barat	40.97
Jawa Tengah	46.84
Jawa Timur	49.62
Bali	51.22
Sumatera Barat	51.24
Kalimantan Selatan	52.09
Sumatera Utara	55.21
Sulawesi Selatan	61.93
DKI Jakarta	63.20
Nusa Tenggara Barat	66.71
Sumatera Selatan	65.01
Lampung	68.51

Note: 'Fraction below' is the fraction of employees with the 2014 wages below the 2014 minimum wages.

effect of minimum wage increases on teenage employment, although only in 10 percent significance level. While the estimated result of the 'fraction affected' specification (column 2) is not significant, a small negative effect was detected. The insignificant result is also found when using the 'fraction at' specification (column 3) but with a higher coefficient in absolute value than the 'fraction affected' result.

4.1.3 School Enrollment

For the school enrollment effect of minimum wage increases, the Difference-in-Difference approach is employed using three specifications of minimum wage measurements. Table 4 reports the estimation results of the three specifications. The results with 'fraction below' (column 1) and 'fraction at' (column 3) find no evidence on the effect of minimum wage increases on school enrollment at any usual significance level while the experiment finds a negative significant effect in the interaction terms using 'fraction affected' specification (column 2). Most of the explanatory variables show a consistent estimate using three different specifications.

4.1.4 Comparing the Different Results

Some comments are warranted because of the different results between the 'fraction below', 'fraction affected' and 'fraction at' specifications. The results in Table 3 suggest that the minimum wage effect estimation is sensitive to different specifications. The sign and significance level are less straightforward to generalize. The 'fraction affected' result is less comparable with the other specification results because it uses the 2013 wages rather than the 2014 wages or as Lemos (2004) puts it "'fraction affected' is a measure of the potential effect of the increase" rather than the actual effect, while 'fraction below' and 'fraction at' use the 2014 wages to calculate the proportion of workers likely affected in each province.

Table 3. Difference-in-Difference estimation results for employment

	(1)	(2)	(3)
_diff	−0.079*	−0.005	−0.032
	(0.043)	(0.047)	(0.045)
Age	0.054***	0.064***	0.068***
	(0.008)	(0.009)	(0.009)
Adultunemp	0.001	0.012	0.013
	(0.012)	(0.028)	(0.011)
Sharepop	0.001	0.002	0.006
	(0.010)	(0.015)	(0.008)
Female	−0.120***	−0.147***	−0.111***
	(0.021)	(0.023)	(0.023)
Urban	0.069***	0.004	0.006
	(0.024)	(0.024)	(0.025)
Parentseduc	−0.075***	−0.044*	−0.076***
	(0.024)	(0.027)	(0.024)
_cons	−0.373*	−0.544***	−0.638***
	(0.194)	(0.192)	(0.179)
Obs.	1915	1650	1685
R-squared	0.059	0.063	0.063

Note: (1)'fraction below', (2)'fraction affected', and (3)'fraction at'. Standard errors are in parenthesis. ***p<0.01, **p<0.05, *p<0.1

The 'fraction affected' estimate suggests that minimum wage increases have no potential effect on teenage employment. Considering that 'fraction affected' uses different years of wage distribution, we are left with 'fraction at' and 'fraction below' for interpretations.

Recall that different specifications measure different groups of workers. 'Fraction at' captures the group near the new minimum wage and measures the effectiveness of the increase, while 'fraction below' captures the workers below the new minimum wage taking into account the non-compliance and spillover of the minimum wage increase. The insignificant estimate using the 'fraction at' specification (column 3) in the employment regression may suggest that the minimum wage is not binding. It does not represent the wage floor in the market, and it does not induce a disemployment effect for teenage workers near the minimum wage. However, if we consider a large fraction of workers in Indonesia are not near, or even below the minimum wage, then the 'fraction below' specification is more preferable, because it captures a wider range of workers who are directly affected by minimum wage increases and that the increases are likely to affect the lowest wage workers in the wage distribution. The estimate of the 'fraction below' specification (column 1) shows a disemployment effect, although it is at 10 percent of significance level. For the school enrollment estimates in Table 4 using 'fraction at' (column 1) and 'fraction below' (column 3), the results suggest no evidence for significant effect. Minimum wage increases do not encourage teenagers to enter or exit the education system.

Table 4. Difference-in-Difference estimation results for school enrollment.

	(1)	(2)	(3)
_diff	0.012	−0.057**	−0.018
	(0.029)	(0.028)	(0.030)
Age	−0.118***	−0.117***	−0.122***
	(0.005)	(0.005)	(0.005)
Adultunemp	−0.052***	−0.061***	−0.049***
	(0.007)	(0.017)	(0.007)
Sharepop	0.009	0.014	0.014***
	(0.007)	(0.009)	(0.005)
Female	0.081***	0.078***	0.084***
	(0.015)	(0.014)	(0.015)
Marital	−0.414***	−0.475***	−0.469***
	(0.027)	(0.026)	(0.029)
Urban	0.013	0.015	0.008
	(0.016)	(0.015)	(0.017)
Parentseduc	0.200***	0.179***	0.190***
	(0.015)	(0.015)	(0.015)
_cons	2.696***	2.679***	2.700***
	(0.121)	(0.107)	(0.107)
Obs.	3339	3101	2900
R-squared	0.320	0.350	0.348

Note: (1)'fraction below', (2)'fraction affected', and (3)'fraction at'. Standard errors are in parenthesis. ***p <0.01, **p <0.05, *p <0.1

4.1.5 Robustness

The estimation of Difference-in-Difference with the 'fraction below' approach further needs to be proved robust for different specifications. To carry out this sensitivity test, the sample is re-run with distinct group's identification strategies. The estimates are shown in Table 5. The first baseline strategy (column 1), as discussed in the research design section, employs a similar number of samples to differentiate the control and treatment groups. Second (column 2), provinces in the list are divided into three groups. Provinces in the control group have less than 50 percent of employees with wages below the minimum wage (high-wage provinces), while the treatment group consists of provinces with more than 60 percent of 'fraction below' workers (low-wage provinces). Provinces with 'fraction below' between 50 percent and 60 percent are excluded from the estimation (medium-wage provinces[3]). The distinction of the regions into three groups based on the proportion of affected workers is used by Card (1992). Third (column 3), we assign the similar number of provinces in the control and treatment groups, and in doing so, one province in the middle of the list is excluded (Kalimantan Selatan province). Six provinces at the top and bottom of the list are comprised as the control and treatment group respectively. Fourth (column 4), All of the provinces are included in the estimation except for Bali province.

Table 5. Robustness tests for Difference-in-Difference with 'fraction below'.

	(1)	(2)	(3)	(4)
Employment				
_diff	−0.079*	−0.074*	−0.087**	−0.074**
	(0.043)	(0.040)	(0.035)	(0.035)
Obs.	1915	2269	2881	2885
R-squared	0.059	0.055	0.054	0.052
School enrollment				
_diff	0.012	0.012	−0.011	−0.009
	(0.029)	(0.027)	(0.023)	(0.023)
Obs.	3339	3992	5022	4967
R-squared	0.320	0.328	0.333	0.333

Note: Estimates obtained using four different group-identification strategies: (1)similar number of sample, (2)high-wage provinces and low-wage provinces, (3)similar number of provinces, and (4)less than 50 percent from the whole sample for each group. Standard errors are in parenthesis. ***p <0.01, **p <0.05, * p <0.1

Table 5 reports some sensitivity analyses for the Difference-in-Difference approach using different group identification strategies. The 'fraction below' results from tables 3 and 4 are included as the baseline for comparison purpose. The results for the employment effect show consistent negative and significant estimates for all the four strategies, and the confidence level becomes 5 percent for the third and fourth strategies. It appears that excluding only one province resulted in a stronger significant level. Consistent results are shown for the school enrollment effect. The corresponding estimates reveals no statistically significant evidence for all of the tests.

4.2 Fixed-Effects Approach

4.2.1 Employment

Another strand of research in the literature is the Fixed-Effects approach. Table 6 presents estimation results using three specifications as well as time and province dummies. When samples of teenagers of age 15-19 are analyzed, the magnitude and significance levels are different. The first specification (column 1) uses the current relative minimum wage, which produces a positive but not statistically significant result. In the second specification (column 2), the relative minimum wage with a one-year lag is employed to measure the effectiveness of the minimum wage in a year after its increases. The result shows a negative effect, significant at the 10 percent confidence level. In the third specification (column 3), the lagged relative minimum wage is added together with the current minimum wage. The coefficient of the lagged relative minimum wage is consistently negative and significant. However, the current relative minimum wage is not statistically significant at any accepted level though the coefficient shows a negative sign. Although having a higher coefficient in absolute value, the one-year lag of the relative minimum wage is consistent with 'fraction below' (Table 3, column 1) specification in Difference-in-Difference ap-

Table 6. Fixed-Effects estimation results for employment.

	(1)	(2)	(3)
Relative minimum wage	0.025	—	−0.022
	(0.349)		(0.350)
Relative minimum wage, one-year lag	—	−0.413*	−0.414*
		(0.246)	(0.246)
Age	0.054***	0.054***	0.054***
	(0.007)	(0.007)	(0.007)
adultunemp	−0.032	−0.034	−0.034
	(0.039)	(0.039)	(0.039)
Sharepop	−0.038	−0.055	−0.054
	(0.036)	(0.036)	(0.037)
Female	−0.115***	−0.115***	−0.115***
	(0.017)	(0.017)	(0.017)
Urban	0.032*	0.031*	0.031*
	(0.019)	(0.019)	(0.019)
parentseduc	−0.054***	−0.054***	−0.054***
	(0.019)	(0.019)	(0.019)
_cons	0.331	0.896*	0.907
	(0.442)	(0.534)	(0.559)
Obs.	3037	3037	3037
R-squared	0.0310	0.0328	0.0328
Province dummies	YES	YES	YES
Year dummies	YES	YES	YES

Note: (1)is the relative minimum wage without one-year lag. (2)is the relative minimum wage with one-year lag. (3)includes both the relative minimum wage. All estimations include province and year dummies. Standard errors are in parenthesis. ***p <0.01, **p <0.05, *p <0.1

proach.

4.2.2 School Enrollment

The school enrollment effect of minimum wage increases is further analyzed in the three specification of the Fixed-Effects approach. The estimation results are shown in Table 7. They reveal no statistically significant effect with or without the one-year lag of the minimum wage variable. The results are consistent with the Difference-in-Difference estimate using 'fraction below' specification.

The Fixed-Effect approach in this study uses the ratio of minimum wages to average wages for measuring the employment and school enrollment effects. The relative minimum wage measures the effect of the minimum wage for workers below the standard wage up to the average wage. The insignificant result in Table 6 using the relative minimum wage without a lagged effect (column 1 and 3) reflects the low compliance with the minimum wage in Indonesia. This result is as expected because firms are likely to set their wages below the current minimum allowed in the presence of non-compliance with the minimum wage law.

However, with a one-year lagged relative minimum wage in Table 6 (column 2 and 3),

Table 7. Fixed-Effects estimation results for school enrollment.

	(1)	(2)	(3)
Relative minimum wage	−0.003	—	−0.006
	(0.167)	—	(0.168)
Relative minimum wage, one-year lag	—	−0.070	−0.070
	—	(0.119)	(0.119)
Age	−0.118***	−0.118***	−0.118***
	(0.005)	(0.005)	(0.005)
Adultunemp	0.030	0.029	0.029
	(0.018)	(0.018)	(0.018)
Sharepop	−0.019	−0.021	−0.021
	(0.017)	(0.017)	(0.017)
Female	0.075***	0.075***	0.075***
	(0.013)	(0.013)	(0.013)
Marital	−0.416***	−0.416***	−0.416***
	(0.021)	(0.021)	(0.021)
Urban	0.003	0.003	0.003
	(0.014)	(0.014)	(0.014)
Parentseduc	0.196***	0.196***	0.196***
	(0.014)	(0.014)	(0.014)
_cons	2.682***	2.766***	2.769***
	(0.223)	(0.254)	(0.266)
Obs.	5253	5253	5253
R-squared	0.1076	0.1077	0.1077
Province dummies	YES	YES	YES
Year dummies	YES	YES	YES

Note: (1)is the relative minimum wage without one-year lag. (2)is the relative minimum wage with one-year lag. (3)includes both the relative minimum wage. All estimations include province and year dummies. Standard errors are in parenthesis. ***p＜0.01, **p＜0.05, *p＜0.1

the results show a disemployment effect, although it is not very statistically significant. This suggests that minimum wage increases induce disemployment for teenage workers in one year after it was introduced. Although the magnitude is higher in absolute value, the result from the lagged minimum wage is similar with the Difference-in-Difference approach with 'fraction below'. The differences in the magnitude of the results may be attributed to the range of group being examined in which some teenage workers with wages above the minimum are disemployed after minimum wage increases.

For the enrollment effect results in Table 7, the interpretation is much more straightforward. The estimate for all the specifications shows an insignificant result, suggesting that minimum wage increases do neither encourage teenagers at schools to drop out, nor encourage teenagers outside education system to enroll in school. The insignificant result is consistent with the Difference-in-Difference approach (Table 4) using 'fraction below' (column 1) and 'fraction at' (column 3) estimates.

4.3 Discussions

We have estimated the employment effect of minimum wage increases for teenagers aged 15–19, using Difference-in-Difference and Fixed-Effects approaches. Using three different minimum wage measurements in the Difference-in-Difference approach, the results are less straightforward to interpret. The 'fraction affected' result shows that minimum wage increases have no potential disemployment effect for teenagers. However, Lemos (2004) suggests that the 'fraction affected' is less reliable because it measures the potential effect and is less comparable with 'fraction at' and 'fraction below' specifications. The insignificant result from 'fraction at' specification suggests that the minimum wage is not binding, which does not represent the market wage floor.

Considering that there is substantial non-compliance with the minimum wage in Indonesia, the 'fraction below' specification is much more preferable to use. It measures the effect in the presence of non-compliance and spillover of the minimum wage increase. The estimation finds a negative and significant effect, although it is not very statistically significant. It is consistent with the evidence from the Fixed-Effect approach, using the relative minimum wage with a one-year lag. The results from the Fixed-Effects regression indicate the one-year lagged effect of minimum wage on employment in Indonesia, particularly from the third specification. The minimum wage may be somewhat binding — it distorts the wage distribution, although it is not the market wage floor — which creates a higher disemployment effect in one year after an increase in the minimum wage is introduced.

A substantial number of papers document an effect of minimum wage increases on teenage employment using Difference-in Difference and Fixed-Effects approaches, but these studies do not study Indonesia. The empirical findings are sometimes conflicting from positive to negative effects depending on the data and the methodological approach. In this study, we find a negative and significant result that teenage employment decreases after minimum wage increases using similar data when using a 'fraction below' specification in the Difference-in-Difference approach, and a lagged relative minimum wage in the Fixed-Effects approach.

The findings confirm Neumark and Wascher's (2007) suggestion that these two approaches, in principle, are similar and they produce different results only when the group of observations being studied differ. The Difference-in-Difference approach with 'fraction below' captures similar groups as the Fixed-Effects approach with a lagged relative minimum wage. Although this study shows consistent results using two different approaches in Indonesia, it does not necessarily have implications for other countries. The underlying assumption of the non-compliance and the lagged effect of minimum wage should be considered and used cautiously.

While we find that minimum wage increases have a disemployment effect, we do not find that they affect school enrollment. Although the estimation using a Difference-in-Differ-

ence approach with 'fraction affected' shows that minimum wage increases potentially have a negative effect on school enrollment, using 'fraction below' and 'fraction at' we find no actual significant effect on school enrollment. These results are consistent with the Fixed-Effects estimate using a relative minimum wage with and without one-year lagged. A higher minimum wage does neither encourage Indonesian teenagers to leave school, nor join the labor market. This is probably an effect of decreasing employment opportunity for teenagers in the labor market as teenagers generally switch between employment and schooling. Furthermore, teenagers might be motivated to continue to have higher education in expectation of being employed in better jobs. This finding indicates no evidence of substitution between school enrollment and employment.

The insignificant result of school enrollment and the negative significant result for employment also indicate that disemployed teenagers are not encouraged to enter the schooling system. They prefer to queue for employment. Hence, they are becoming idle, neither in school nor employed. These findings suggest an increased proportion of teenagers will be in an idle status due to minimum wage increases.

This study is constrained by data availability. Some extended versions of the Fixed-Effects approach use a linear trend (Allegretto et al., 2011), and a quadratic linear trend (Sturn, 2016) to measure the long-run effect of minimum wage increases, but it would require a longer time of panel data than we have. Although IFLS5 provides detailed information about the characteristics of individual and household respondents, wage information covers only during interviews and a year before. Thus, the years selected for this study are 2013 and 2014 to which the possibility of time trend could not be applied.

This study uses 'fraction affected', 'fraction below' and 'fraction at' specifications to identify treatment and control groups for the Difference-in-Difference approach. Another possible technique is to use reservation wages. It is the lowest wage in which an individual is willing to work. If a person has a reservation wage under the new minimum wage, then that person may be assigned to the treatment group. Identifying the treatment group and the control group using the reservation wage might address the research problem more effectively in a future study.

5. Conclusions and Policy Implication

The purpose of this study is to analyze the effect of minimum wage increases on employment and school enrollment in Indonesia between 2013 and 2014 for teenagers aged 15–19 years. Indonesia is an interesting case because the provincial variations in minimum wages provide a way to identify the effect of minimum wage increases. The main consideration in this study is the non-compliance with the minimum wage in Indonesia. The effect

of minimum wage increases is analyzed using Difference-in-Difference and Fixed-Effects approaches using the fifth wave of IFLS.

The Difference-in-Difference approach is employed by using three different specifications: 'fraction affected', 'fraction below' and 'fraction at'. The 'fraction below' specification is preferred for this study, as it accounts for the non-compliance and spillover of minimum wages. A substantial non-compliance with minimum wages is present in Indonesia. The 'fraction below' estimate shows a disemployment effect of the minimum wage increases. The Difference-in-Difference is further used for analyzing the school enrollment effect. The 'fraction below' estimations find no evidence that raising the minimum wage alters school enrollment. Using Difference-in-Difference with the preferred specification — 'fraction below' — this study finds a disemployment effect but no effect on school enrollment for teenagers in Indonesia.

Another empirical approach in this study is the Fixed-Effects. The ratio of the minimum wage to the average wage is used for this approach. This relative minimum wage is measured by three specifications: the current relative minimum wage, the one-year lagged relative minimum wage and both the relative minimum wage variables. The inclusion of a one-year lag to account for the possibility that minimum wage increases may have an effect in one year after introduction due to the non-compliance. Firms might increase wages below the current minimum wage but above the previous minimum wage before inducing disemployment. Using the one-year lagged relative minimum wage — the preferred specification — the study finds a disemployment effect. The Fixed-Effects approach is also employed for estimating the school enrollment effect. The estimation finds no evidence that minimum wage increases alter school enrollment using the three specifications. Similar results using Difference-in-Difference with 'fraction below' and Fixed-Effects approach with a one-year lag minimum wage specification are found. Minimum wage increases have a disemployment effect but have no effect on school enrollment.

The estimation using the preferred specifications for the two approaches finds no evidence of substitution between school enrollment and employment. There is a stronger disemployment effect using a one-year lag of the relative minimum wage, which indicates a somewhat binding minimum wage, in spite of non-compliance. However, raising minimum wages appears not to have a significant effect on school enrollment. These findings suggest that the disemployed teenagers contribute to the increase in proportion of teenagers becoming idle (neither school nor employed) after minimum wage increases.

The findings of this study indicate that minimum wage increases push some teenagers out of the market, but they do not encourage them to enter the schooling system. The scarring effect is that the disemployed teenagers might be trapped in the idleness status. In the long-run, the accumulation of human capital of these idle teenagers might decrease the national productivity. If policy makers in Indonesia are concerned about improving the

productivity of teenagers for the upcoming demographic bonus, complementary policies ought to be considered. The government could initiate a sub-minimum wage policy for teenagers aged 15-19 while it could strengthen enforcement. This sub-minimum wage must be below the adult minimum wage like the system in the UK. The sub-minimum wage is expected to increase teenage disemployment while the adult minimum wage could encourage the disemployed teenagers to enroll in school. The idea is to make schooling the best investment for future earnings so that Indonesia can benefit from the future demographic bonus.

Notes:

1) The authors are aware of the debate surrounding the inclusion of Turkey in the developing countries group. However, Turkey is a member of Developing-8 countries together with Indonesia, and it suggests that Turkey has similar characteristics in the economy with developing countries particularly Indonesia.
2) See appendix for 'fraction affected' and 'fraction at' results.
3) This process results in a control group consisting of individuals living in DI Yogyakarta, Jawa Barat, Jawa Tengah and Jawa Timur provinces (four provinces), while the treatment group consists of those living within the province Sulawesi Selatan, DKI Jakarta, Nusa Tenggara Barat, Sumatera Selatan, and Lampung provinces (five provinces).

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Appendices

Appendix A: Province 'Fraction Affected'

Table 8. 'Fraction affected' in each province

Provinces	Percentage
DI Yogyakarta	1.47
Sumatera Barat	1.66
Nusa Tenggara Barat	2.89
Jawa Tengah	3.78
Jawa Barat	4.39
DKI Jakarta	4.76
Sumatera Selatan	4.85
Kalimantan Selatan	4.90
Sumatera Utara	4.90
Jawa Timur	5.34
Lampung	6.05
Sulawesi Selatan	6.99
Bali	9.52

Note: 'fraction affected' as the proportion of workers receiving the 2013 wages between or equal to the 2013 and 2014 provincial minimum wages.

Appendix B: Province 'Fraction At'

Table 9. 'Fraction at' in each province

Provinces	Percentage
Bali	0.28
Lampung	0.35
Kalimantan Selatan	0.66
Sulawesi Selatan	1.01
Nusa Tenggara Barat	1.14
Jawa Tengah	1.21
Sumatera Selatan	1.34
Jawa Timur	2.21
Jawa Barat	2.63
Sumatera Utara	2.82
Sumatera Barat	3.71
DI Yogyakarta	4.09
DKI Jakarta	4.16

Note: 'fraction at' measures the fraction of employees with the 2014 wage near the 2014 minimum wage.