THE EFFECTS OF CHANGES IN MINIMUM WAGE ON WAGES, EMPLOYMENT AND HOURS WORKED IN INDONESIA

Devanto Shasta Pratomo

S.E. (B.Sc in Economics and Development Studies), Brawijaya University, Indonesia.
M.Sc. in Development Economics, Gadjah Mada University, Indonesia.
M.A. in Economics, Georgia State University, USA.

Thesis submitted in fulfilment of the requirements
for the degree of Doctor of Philosophy

Department of Economics
Management School
Lancaster University

January 2009

THE EFFECTS OF CHANGES IN MINIMUM WAGE ON EMPLOYMENT AND HOURS WORKED IN INDONESIA

Devanto Shasta Pratomo

ABSTRACT

This thesis examines the effects of changes in minimum wage on wages, employment and hours worked in Indonesia. This study is important for Indonesia as a part of the policy evaluation relating to the minimum wage policy changes since the end of 1980s. Based on the standard competitive model, an increase in minimum wage is predicted to decrease the level of employment. More specifically, under the two-sector model, an increase in minimum is predicted to decrease employment in the covered sector and to increase employment in the uncovered sector, given a high proportion of uncovered sector employment in developing countries.

Three main empirical analyses are conducted in this thesis. Firstly, using a regional panel data method, this study examines the effects of changes in minimum wage on wages and employment in Indonesia. Although the findings vary across different minimum wage measures and panel data methods, the result suggests that an increase in minimum wage increases wages and reduces paid employment in the covered sector, as predicted by the standard competitive model. The result shows that there is

no significant impact on total paid employment because of the non-compliance problem in Indonesia.

Secondly, extending the analysis, this thesis examines the effects of changes in minimum wage on employment in the covered and uncovered sectors using an individual micro-level data. The results suggest that an increase in minimum wage is more likely to decrease the covered sector employment and to inrease the uncovered sector employment. These results also indicate a displacement effect from the covered sector to the uncovered sector, as suggested by the two-sector model.

Thirdly, providing a complete analysis of any adjustments in labour demand, this thesis examines the effects of changes in minimum wage on hours worked as an alternative measure of employment. Using a selection biased correction method based on multinomial logit, the empirical results suggest that an increase in minimum wage increases paid employment hours worked. However, compared to the minimum wage effects on employment, this hours effect is relatively small. The main reason is because the Indonesian minimum wage is set based on monthly term, suggesting a greater change in per-worker cost than in per-hour cost.

DECLARATION

This thesis, *The Effects of Changes in Minimum Wage on Wages, Employment, and Hours Worked in Indonesia*, has been written by myself. It has not been submitted in any form for the award of a higher degree elsewhere.

ACKNOWLEDGMENTS

I would like to express my gratitude to my supervisor, Dr. Rob Simmons, for his valuable supervision, encouragement, and patience throughout my study in Lancaster University. From him, I have learned so much about how to do research in economics. I would also like to thank Professor Steve Bradley, Professor David Peel and Professor Geraint Johnes for their critical comments and suggestions to improve the analysis. I am also indebted to Gill Burgess, from Student Learning Development Centre, who has kindly helped me to improve my English.

I am grateful to the Department of Economics Lancaster University and for studentship awarded to me throughout my study at the Lancaster University. I am also grateful to the Peel Studentship Trust who has supported a studentship during my final year. I would also like to thank to Brawijaya University for supporting the tuition fee throughout my study.

Finally, I would like to express my gratitude to my family, particularly my wife Abby Handayani, for offering valuable encouragement, support and patience during my study and making our living in Lancaster enjoyable. My appreciation also goes to my father Bambang Guritno and my mother Rien Samudayati, for their endless prayer, support, and patience to wait for me to come back to Indonesia.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

The effect of minimum wage laws on employment has been the subject of much debate in the literature since the early 1990s (see for example the debate over the minimum wage effects in the United States between Card et al (1994) and Neumark and Wascher (1992)). Based on the standard theory, a standard competitive model predicts that a minimum wage which is above the equilibrium level will lower the level of employment. Contrary to the standard competitive model, the monopsony model predicts that an increase in minimum wage, under particular conditions, leads to an increase in employment. The empirical results depend on several factors, including the labour market conditions, the methodology (time-series, cross-sectional or panel data), the object of the study (developed or developing countries), the measurement of the minimum wage variable, and the unit of observation (individual or aggregate level).

There are large numbers of empirical studies on the effects of minimum wage on employment in developed countries. One of the most influential of such studies was the "natural experiment" study conducted by Card and Krueger (1994) in the United States. Using the data from fast-food restaurants in New Jersey and Pennsylvania, they found that an increase in New Jersey's minimum wage had positive effects on employment, supporting the presence of the monopsony model. Contrary to Card and Krueger (1994), the other influential studies conducted by Neumark and Wascher

(1992 and 2004) consistently found negative effects of minimum wage on employment, supporting the presence of the standard competitive model.

Contrary to developed country studies, there are limited empirical studies on the effects of minimum wage on employment in developing countries. Most have been conducted in Latin American developing countries (see for example Lemos (2004d) in Brazil and Gindling and Terrell (2006 and 2007) in Honduras and Costa Rica). Compared to developed countries, developing countries generally show different characteristics, given a high proportion of workers in the uncovered sector. An increase in minimum wage is therefore also predicted to have a substantial indirect impact on workers in the uncovered sector, assuming flexible labour mobility between covered and uncovered sectors.

In Indonesia, the minimum wage coverage depends on the category (status) of employment. Paid employment is the category of employment legally covered by the minimum wage policy in Indonesia (the so-called covered sector employment), accounting for approximately 35% of total employment. On the other hand, self-employed and unpaid family workers are categorized as the uncovered sector employment. According to the Indonesian Central Bureau of Statistics definition, self-employed is defined as own-account workers employed in their own enterprises with or without assistance from their household members/temporary workers (such as street traders, self-employed farmers or taxi drivers), while unpaid family work is defined as those people who worked on their family-owned business or farm without any wage for their work. As pointed out by Rice (2004), unpaid family work in Indonesia is usually given compensation in an informal manner, such as sharing the room in their household or sharing the foodstuff from their own farm.

The main focus of this thesis is to examine the effects of changes in the minimum wage on wages, employment and hours worked in Indonesia. The minimum wage policy in Indonesia was firstly introduced in the early 1970s, but the implementation was not effective in earlier periods (Suryahadi et al, 2003). The Indonesian government has become more concerned about the minimum wage policy since the end of the 1980s, as a result of international pressures relating to the violation of international labour standard issues in Indonesia. In that period, the United States trade union organization (the AFL-CIO) and some international human right activists complained to a well-known US multinational firm operating in Indonesia about their low wages and poor working conditions by creating a "social clause" which suggested rejecting a product from Indonesia (Gall, 1998 and Suryahadi et al, 2003). As a result, this condition forced the Indonesian government to become more concerned about their minimum wage policy by increasing the minimum wage level three-fold in nominal terms (or two-fold in real terms). More detail about the minimum wage policy implementation in Indonesia is presented in chapter 3. This study is therefore important for Indonesia as a part of the policy evaluation relating to the minimum wage changes during the reference period. This evaluation can also be used as recommendations for the government in making decisions relating to minimum wage policy implementation in Indonesia in the future.

This thesis is not the first study on the effect of minimum wage on employment in Indonesia. Rama's (2001) pioneering study on the impact of the minimum wage in

Indonesia using regional panel data methods focused primarily on urban areas and the manufacturing sector. Using a similar regional panel data method, Suryahadi et al (2003) extended Rama's (2001) study by examining the effects of the minimum wage on specific groups of workers such as females, youths and less educated workers in the urban formal labour market. The most recent minimum wage study in Indonesia was a case study conducted by Alatas and Cameron (2008) studying the impact of compliance extension of Jakarta's provincial minimum wage on the Botabek area (Jakarta and West Java border) which is administratively under the province of West Java.

Compared to the previous Indonesian minimum wage studies, this thesis generally provides a more comprehensive study of the impact of minimum wage on employment in Indonesia using both aggregate regional panel data and individual pooled cross-sectional time-series data methods. This study not only focuses on workers in the covered sector, but also looks at the impact of minimum wage on employment in the uncovered sectors, given a high proportion of workers in the uncovered sector in Indonesia. This study will also treat these impacts separately in terms of the urban and rural labour markets, as well as in terms of the male and female labour market, which have not been considered in previous studies. In addition, this study fills the gap by estimating the effects of changes in the minimum wage on hours worked as an alternative measure to employment, providing a complete analysis of any shifts in labour demand as the minimum wage increases. The Indonesian data have never been used for these purposes.

Compared to the other developing country studies, Indonesia's case provides a unique characteristic in that the minimum wage is set differently across provinces (regions), providing an ideal source for a regional panel data study. In Brazil and Colombia (see Lemos, 2004d and Arango and Pachon, 2004), the minimum wage is set at a national level, while in Costa Rica and Honduras (see Gindling and Terrell, 2006 and 2007), the minimum wage is set at an industrial and firm-size level. As mentioned above, this study also contributes to the developing country literatures by providing a complete specification of the impact of minimum wage on employment in the covered and uncovered sectors. There are only a few studies examining the effects of minimum wage on employment in the covered and uncovered sectors in developing countries, such as Gindling and Terrell in Costa Rica and Honduras (2006 and 2007). Although this study specifically focuses on the impact of minimum wage on employment (and hours worked) in Indonesia, its results will also be relevant for other developing countries with similar labour market characteristics.

This thesis primarily uses the Indonesian Labour Force Survey (the so-called Sakernas) data from 1989 to 2003 for the regional panel data method (chapter 5) and from 1996 to 2003 for the pooled cross-sectional time-series method (chapters 6 and 7). This thesis does not compare a period with no minimum wage (before the introduction of the minimum wage) and a period with minimum wage (after the introduction of the minimum wage) as the minimum wage policy exists throughout the reference period. In practice, the minimum wage is adjusted annually depending on the cost of minimum basic living needs (the so-called KHM or Kebutuhan Hidup Minimum). In this case, several econometric techniques will be employed including panel data methods, the multinomial logit model, and the selection biased correction model based on multinomial logit. In addition, unlike the common labour force survey in developed countries, Sakernas data used in this study does not provide the longitudinal change across individuals in the labour market. Therefore, aggregate regional panel data and the individual pooled cross-sectional time-series methods will be employed in this study.

The remainder of this thesis is organized as follows. Chapter 2 reviews the labour market situation in Indonesia. Some major labour market statistics in Indonesia will be presented in this chapter, including the labour force participation rate, unemployment rate, labour force educational attainment, status of employment, sector of activities and wages. These statistics are also important to see the employment and labour force conditions in response to labour market policies and macro-economic shocks in Indonesia.

Chapter 3 discusses minimum wage policy implementation in Indonesia, including the mechanism to set the minimum wage level and the effectiveness of minimum wage compliance in Indonesia. This chapter will also specifically discuss the minimum wage fixing in the decentralization era (after the new regime), where the provinces and local district governments have the power to set their own minimum wage level. In practice, before 2001, the central government determined the level of each provincial minimum wage (centralization era) based on the provincial level governments recommendations. In addition, the trend in the average minimum wage level and its ratio to the average wage will also be presented in this chapter. The ratio of minimum wage level to the average wage (the so-called toughness) simply measures the level of minimum wage and how consistent the minimum wage is kept at its level (Machin and Manning, 1994).

Chapter 4 presents the standard theoretical framework relating to the effect of the minimum wage on employment. According to the standard competitive model, an increase in the minimum wage that has a positive impact on wages is predicted to reduce employment. This model will also be extended using the two-sector model of covered and uncovered sectors. In practice, the two-sector model might be more complete for developing countries, given a high proportion of workers in the uncovered sector. In comparison, the monopsony model will also be reviewed where the minimum wage might have a positive impact on employment under particular conditions.

In chapter 5, the effects of changes in minimum wage on wages and employment in Indonesia are examined using the aggregate regional panel data method over the period 1989 to 2003. This chapter provides a basic analysis of the impact of minimum wage on wages and employment in Indonesia using a similar aggregate panel data method employed by the previous minimum wage studies in Indonesia (see Rama, 2001 and Suryahadi et al, 2003). As mentioned above, compared to the other developing countries, Indonesia provides a better source for a panel data study as the minimum wage is set differently across regions (provinces), giving more regional variation. The effect of the minimum wage on the wage level will be examined before examining the effect of the minimum wage on employment. We might expect that an increase in the minimum wage will affect employment in the covered sector if it has a significantly positive effect on the covered sector wage. In addition, this chapter also compares five different minimum wage measurements commonly used in the literature (a) the log of real minimum wage; (b) toughness; (c) the fraction below the minimum wage; (d) the fraction at the minimum wage; (e) the fraction affected by the minimum wage. There is no clear justification of which measure is the most effective to measure the minimum wage effect in the literature, depending on the methods and the object of study.

Chapter 6 extends the analysis by estimating the effects of changes in the minimum wage on employment in the covered and uncovered sectors using an individual micro-level data set, providing a complete analysis of the effects of the minimum wage on employment in Indonesia. Under the two-sector model, an increase in the minimum wage is predicted to decrease employment in the covered sector and to increase employment in the uncovered sector (see chapter 4 for theoretical framework discussion). Using the multinomial logit model, I examine the effects of the minimum wage on several employment categories including paid employed (covered sector), self-employed and unpaid family worker (uncovered sector), and unemployed. The analysis is also separated across gender (male and female workers) and their residence location (urban and rural areas). In addition, this chapter is extended by examining the effect of the minimum wage on youth employment in both the covered and uncovered sectors. In practice, youth employment is generally known as the category of employment that is typically at the bottom of the wage distribution. Therefore, it is predicted that they are more likely to be affected by the minimum wage.

In order to provide a complete analysis of the effects of the minimum wage on labour demand, in chapter 7, the effect of the minimum wage on hours worked is examined as an alternative to employment using an individual micro-level data set. As pointed out by Hamermesh (1993), employers might respond to a change in minimum wage by changing their number of workers (employment) at the *extensive margin* and by adjusting their workers' hours at the *intensive margin.* This chapter contributes to the literature by employing selection biased corrections based on the multinomial logit model for a potential selection bias from a non-random sample. In practice, individuals selected in the sample might select themselves (self-selection) into an employment sector (or category) where they have a preference depending on their potential hours worked, suggesting that they are likely to be non-random samples from the population. Specifically, individuals who expect fixed (or standard) working hours are more likely to select themselves (self-selection) into the paid employment category, while individuals who expect more flexible (such as part-time) working hours might put themselves into the self-employed and unpaid family workers categories. Two different approaches of selection bias correction, including Lee's and Bourguignon et al's methods, are performed in this chapter. Similar format to chapter 6, the effects of minimum wage on hours worked are also examined separately across urban-rural areas and male-female workers.

Finally, chapter 8 summarises the findings and provides conclusions. As part of the policy evaluation, this chapter also suggests some policy implications relating to minimum wage policy implementation in Indonesia.

CHAPTER II

LABOUR MARKET SITUATION

Indonesia is the fourth most populous country in the world after China, India, and the USA with a total population of more than 205 million in the 2000s (based on the 2000 population census result). The working age population (defined as 15 years of age and older) accounts for approximately 150 million in 2002, growing significantly by 31% from 1990 to 2002 (see table 2.1). However, the growth in the working age population has tended to decrease over time due to a decrease in total fertility rate as a result of an effective national family planning program by the government since the 1980s.

In line with the growth in working age population, the Indonesian labour force grew by approximately 33% from 1990 to 2002. Although there was a significant growth in the labour force, the labour force participation rate (LFPR) was relatively stable at around 66%-69% during the reference period (see table 2.1). This condition confirms that the growth of the labour force in Indonesia is mostly affected by the natural growth in population (Irawan et al, 2000 and Suryahadi et al, 2001). Compared to the other South East Asian countries, the LFPR in Indonesia is slightly higher than the LFPR in the Philippines, Singapore, and Malaysia with about a 60% participation rate, but it is lower than the LFPR in Vietnam and Malaysia with more than 70% participation rate (Irawan et al, 2000).

Table 2.1. Labour Market Characteristics, 1990-2002

	1990	1993	1996	1999	2002
Population and Labour Force					
Population aged 15+ (million)	113.09	120.30	131.37	141.10	148.73
Labour Force (million) [a]	75.02	78.92	88.37	97.42	100.32
Labour Force Participation Rate [b]	66.33	65.60	67.26	69.05	67.45
Unemployment Rate (%) [c]	2.55	2.79	5.45	8.83	8.65
Urban Labour Force (%)	25.65	29.60	34.06	38.26	41.79
Female Labour Force (%)	38.79	38.55	38.71	38.98	37.13
Youth Labour Force (%) [d]	23.04	22.20	22.44	22.18	20.45
Education [e]					
< Primary (%)	40.13	35.48	28.43	24.9	21.94
Primary (%)	36.27	36.94	37.27	36.03	36.7
Junior High School Qual. (%)	10.1	11.31	13.04	15.5	17.32
Senior High School Qual. (%)	11.52	13.59	17.45	19.06	19.18
University Qualification (%) [f]	1.97	2.68	3.81	4.51	4.87

Note: [a] The labour force is the numbers of person in the workforce (the employed) and the unemployed
[b] The Labour Force Participation Rate is the labour force, as a percentage of working-age population
[c] The unemployment rates before 1994 are slightly underestimated as it does not include discourage workers. Discourage workers data is collected by the government from 1994 onward.
[d] Youth labour force is defined as persons aged 15-24 years old in the labour force
[e] Proportion of the Labour Force relating to the education attainment
[f] University Qualification includes academy/college and diploma

Source: Calculated from the Indonesian Labour Foce Survey (Sakernas)

The unemployment rate had increased from only 5.45% in 1996 to 8.65% in 2002. In this case, following the National Central Bureau of Statistics (BPS) definition, the unemployment rate is defined as the percentage of the labour force who do not have a job and who are actively looking for a job, including discouraged workers who are still willing to work, as suggested by the relaxed ILO's labour force definition (see Hussmanns et al, 1990 and Suryadarma et al, 2005). Although this definition (which includes discourage workers who are still willing to work) is not a common practice in the literature, Suryadarma et al (2005) argued that those discouraged workers behave similarly to the unemployed particularly during the slow growth of an economy after the major economic crisis in 1997-1998, providing a valid measure of labour force. In addition, Ahmed and Dhanani (1999), also argued that including those discouraged workers who were willing to accept work at the time of the survey will provide true magnitude of unemployment and will not understate the actual labour force size in Indonesia.

As the country worst affected by the East Asian economic crisis in 1997-1998, the unemployment rate in Indonesia was lower than had been predicted (see Irawan et al, 2000 and Feridhanusetyawan and Gaduh, 2000). The Indonesian economic crisis primarily caused by the financial market contagion had been characterized by a devaluation of Rupiah by more than 80% and a decrease in Gross Domestic Product of 13% during that period. This crisis negatively affected employment in the construction sector and the export-oriented manufacturing sector which depended primarily on the imported raw-materials and associated credit arrangements (Manning, 2000).

In the absence of any unemployment benefits provided by the government, people (especially from low-income households) were unlikely to be unemployed for a long period (long-term unemployed) and were likely to find a job in the informal sector, usually with low wages, short working hours and few employment benefits. As pointed out by Islam (2002), long-term unemployment (defined as those unemployed for a year or more) was only around one percent of total unemployment in Indonesia. This condition actually also indicates a flexible labour market in Indonesia (Feridhanusetyawan and Gaduh, 2000). Moreover, although there are no particular unemployment benefits, the government of Indonesia has created programs to address the problem of unemployment in some areas, such as a public works scheme designed by the Ministry of Manpower and training and counselling programmes for the unemployed by the Department of Social Affairs (Wiebe 1996).

There are some important characteristics of unemployment in Indonesia. Firstly, among the unemployed, most are young people who entered the labour market for the first time with relatively little work experience (Agrawal, 1995 and Feridhanusetyawan and Gaduh, 2000). In addition, as pointed out by Dhanani (2004), a higher rate of youth unemployment is also caused by youths making the transition from full-time education to the labour market. As presented in table 2.2, the unemployment rate among young people (15-24 years old) is much higher than the unemployment rate among adults (25+ years old) during the reference period. In 2002, the youth unemployment rate was 27.3%, while adult unemployment rate was only 3.85%.

Table 2.2. Unemployment Rates by Age, Education, Location and Gender (%), 1990-2002

	1990	1993	1996	1999	2002
Age:					
15-24	7.98	8.94	16.59	25.08	27.30
25+	0.92	1.03	2.22	4.20	3.85
Education:					
< Primary	0.51	0.41	1.36	3.41	3.53
Primary	1.27	1.45	3.04	6.14	6.00
Junior High School Qual.	4.14	3.99	7.76	11.43	11.69
Senior High School Qual.	11.34	10.24	14.09	17.89	16.38
University Qualification	7.96	9.77	12.03	13.11	10.39
Location:					
Urban Areas	5.98	5.55	8.98	13.28	11.53
Rural Areas	1.36	1.63	3.62	6.08	6.58
Gender:					
Male	2.46	2.63	4.56	7.64	7.11
Female	2.69	3.04	6.85	10.70	11.25

Source: Calculated from the Indonesian Labour Foce Survey (Sakernas)

Secondly, the unemployment rate is higher among those with higher levels of education (Feridhanusetyawan and Gaduh, 2000). This evidence indicates that only people with higher levels of education (usually with higher family incomes) might remain unemployed in order to wait for a better-paid job, while people with lower education levels (usually with lower family income) cannot afford to be unemployed for a long period and will find a job either in the informal sector or the formal sector but with lower wages (Agrawal, 1995 and Irawan et al, 2000). As presented in table 2.2, the unemployment rate among people with senior high school and university qualifications was 16.38% and 10.39% respectively in 2002, while the unemployment rate among less educated people (a primary or less than primary education) was less than 7%.

Thirdly, comparing residence location, the unemployment rate in urban areas is higher than in rural areas. The main reason is that the proportion of people who are looking for a job is higher in urban areas than in rural areas (Dhanani, 2004). As pointed out by Dhanani (2004), it is generally assumed that the probability of getting a job is higher in urban areas than in rural areas because the job choices in rural areas are relatively limited (particularly in the agriculture sector) compared to urban areas. In addition, wage expectations are relatively low in rural areas compared to urban areas.

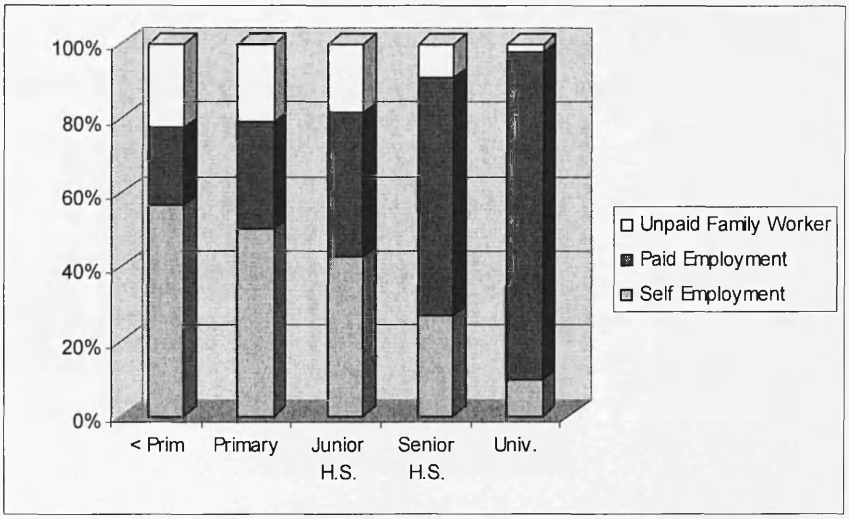
Comparing urban and rural areas, similar to the other developing countries, the highest proportion of the labour force in Indonesia is located in rural areas with the dominance of workers in the agriculture sector (Manning, 2003a). However, the proportion of the labour force in rural areas showed a significant decrease from 74.35% in 1990 to 58.21% in 2002. This decrease indicated a substantial urbanization process from rural areas to urban areas, and this was further supported by the evidence of structural employment shifts from the agriculture sector in rural areas to the manufacturing, trade, and service sectors (modern sectors) in urban areas.

Moreover, as presented in table 2.1, the proportion of females within the total labour force changed only a little around 37-38%, except during the 1997-1998 economic crisis where the proportion of females in the labour force was more than 40%. In practice, as pointed out by Feridhanusetyawan and Gaduh (2000), the economic crisis has forced more females to enter the labour market to bring in additional income to their household. In addition, Manning (2003a) noted that a high proportion of female workers (about 40% of all female workers) in Indonesia is represented in less productive sectors and low wage occupations, such as retail trade and labour-intensive manufacturing sectors.

On the other hand, the youth labour force slightly declined from 23% in 1990 to 20% in 2002 (see table 2.1). As pointed out by Manning (2003a), this decline is, firstly, because of the lower fertility rate as a result of an effective family planning program since the 1980s. Secondly, this is because of a rapid growth in schooling opportunities with the nine-year compulsory basic education scheme encouraged by the government over the last two decades.

Looking at educational attainment, there was only a small proportion of the total labour force with senior high school or university (tertiary) qualifications. However, these education qualifications showed a significant increase from 13.5% in 1990 to 24.05% in 2002, suggesting that the Indonesian labour force has become more educated. On the other hand, there was a significant drop in the proportion of those with a primary or less than primary education (less educated). As pointed out by Agrawal (1995), this significant drop was induced by a substantial investment in basic education by the government with their nine-year compulsory basic education program. In addition, as pointed out by Manning (2003a), the majority of more educated people are more likely to be employed in the formal sector in paid employment, while less educated people tend to be self-employed and unpaid family workers (see figure 2.1).

Figure 2.1 Status of Employment by Educational Attainment in 2002 (%)



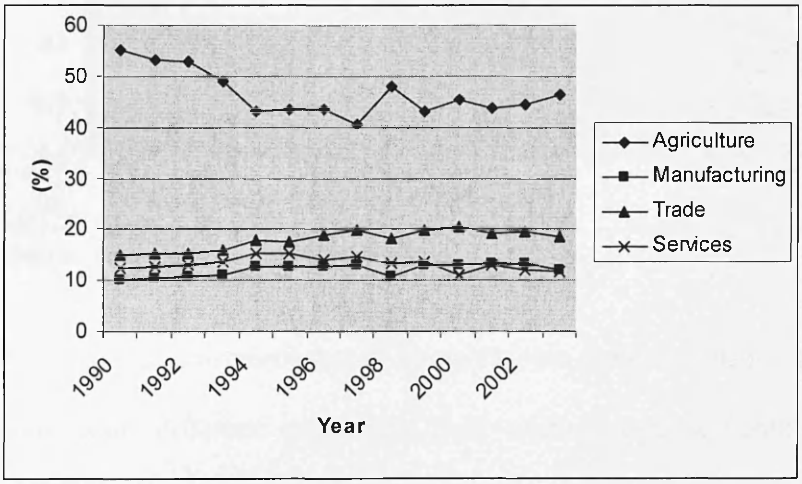
Source: Calculated from the Indonesian Labour Foce Survey (Sakernas)

Relating to sector of activities, the agriculture sector is still the most dominant sector, accounting for more than 40% of total employment. However, its share of employment decreased significantly from 55% in 1990 to only 44% in 2002 (see figure 2.2). On the other hand, the manufacturing sector slightly increased from 10.2% in 1990 to 13.21% in 2002. This feature clearly confirms the process of structural transformation in Indonesia marked by the shift in employment from the agriculture sector to modern sectors, such as manufacturing industry, trade, and services[1]. The exception was found during 1997-1998 economic crisis when there was a significant

[1] Compared to the other East Asian developing countries, this structural transformation in Indonesia is relatively slow particularly because of the Indonesian economy dependence on oil and gas mining (natural resources) before the 1990s (Feridhanusetyawan and Gaduh, 2000)

increase in agricultural sector activities. As pointed out by Feridhanusetyawan and Damuri (2004), this crisis period was generally characterized by a substantial decrease in the construction, financial, and capital-intensive manufacturing sector activities and the movement of resources to agricultural and export-oriented activities. However, this did not occur in the longer period because of the limited absorption capacity of the agricultural sector (Feridhanusetyawan and Gaduh, 2000).

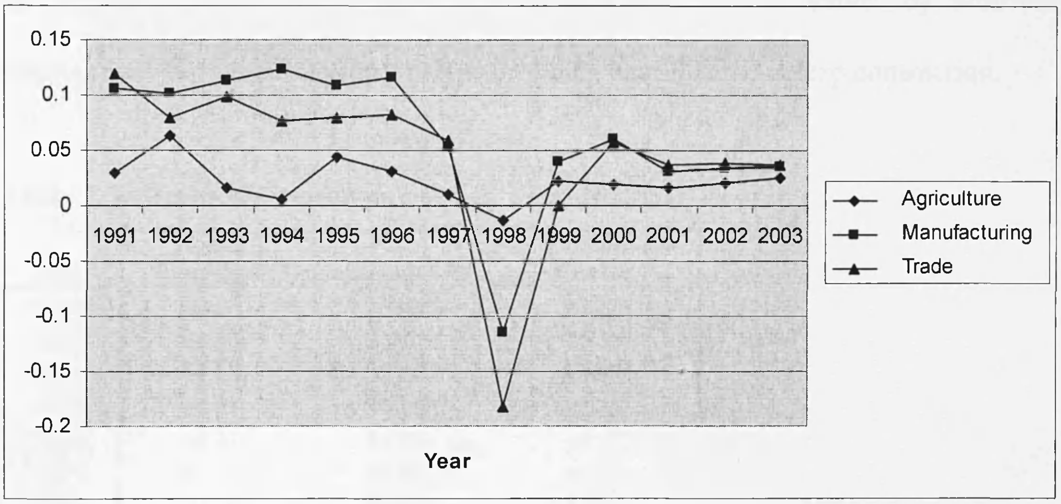
Figure 2.2. Employment in Major Sector of Activities (%)



Source: Calculated from the Indonesian Labour Foce Survey (Sakernas)

Although there is a high proportion of employment in the agricultural sector, their contribution to the Gross Domestic Product (GDP) is relatively low compared to the other sector of activities. The biggest sector that contributed to the GDP is the manufacturing sector, accounting for more than 25% of total GDP. As presented in figure 2.3, the manufacturing sector also grew at a higher rate compared to the other sectors, except during the economic crisis in 1997-1998. In practice, this significant growth in the manufacturing sector was a result of considerable Foreign Direct Investment (FDI) inflows from the end of the 1980s when the government had started to change their development strategy from the dependence on natural resources, particularly from oil exports, to the export-oriented manufacturing activities (Agrawal, 1995). In addition, Manning (2003a) pointed out that the manufacturing sector is characterized by higher productivity compared to the other sectors.

Figure 2.3. Gross Domestic Product Growth by Major Sector of Activities



Source: Asian Development Bank Data

In terms of employment status, the workforce (employment) is generally divided into three main different categories: paid employment, self-employment, and unpaid family workers. In this case, we focus only on the primary status of employment or activity during the previous week of survey due to data unavailability for workers with secondary job (more than one job). As mentioned above, relating to minimum wage coverage in Indonesia, paid employment is categorized as covered sector employment (also defined as formal sector employment), while self-employed and unpaid family workers are grouped as uncovered sector employment (also defined as informal sector employment).

As presented in table 2.3, the informal sector (self-employed and unpaid family workers) has a relatively large proportion in the labour market. According to Irawan et al (2000), a large proportion of the informal sector indicates limited work in the formal sector (paid employment) in Indonesia. However, according to the Sakernas, the proportion of informal sector employment, such as self-employed farmers, unpaid family workers or street traders, which is mainly found in rural areas, declined from 71.32% in 1990 to 64.08% in 2003, except during the 1997-1998 crisis period when the informal sector played an important role as a 'safety valve' by absorbing employment from the urban formal sector which has suffered a deep contraction.

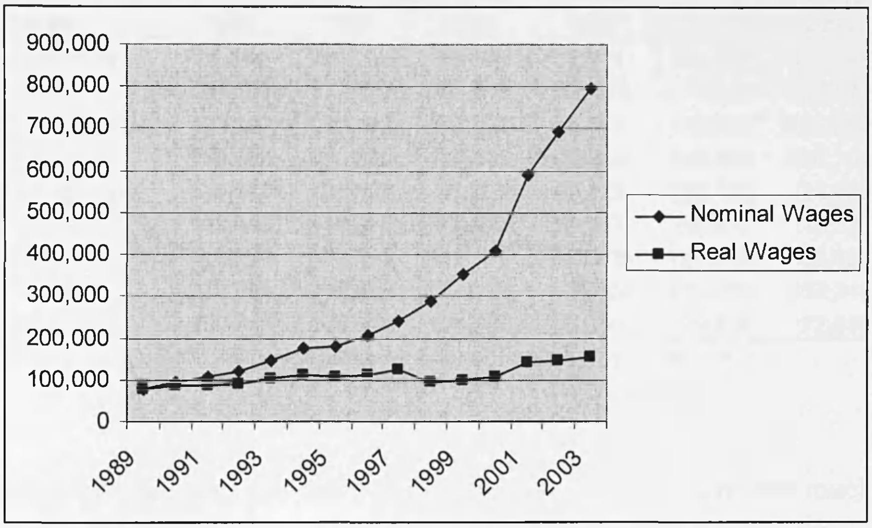
Table 2.3 Status of Employment (%), 1990-2003

Year	Self-Employed	Paid Employment	Unpaid Family Worker
1990	44.9	28.68	26.42
1991	44.59	30.08	25.33
1992	44.83	30.21	24.96
1993	44.91	31.74	23.35
1994	44.37	34.52	21.1
1995	45.86	36.69	17.45
1996	47.56	34.78	17.65
1997	45.07	36.14	18.79
1998	46.62	33.51	19.86
1999	47.09	34.06	18.85
2000	45.81	33.59	20.6
2001	42.92	37.1	19.98
2002	44.62	37.28	18.1
2003	43.93	35.93	20.15

Source: Calculated from the Indonesian Labour Foce Survey (Sakernas)

On the other hand, the proportion of formal sector employment (paid employment), which is mainly found in urban areas, increased from 28.68% in 1990 to 35.93% in 2003, suggesting a tendency of formalization in the Indonesian labour market (Feridhanusetyawan and Gaduh, 2000). This evidence was consistent with the structural transformation process mentioned above, which is supported by the development of the manufacturing sector and the strong urbanization process. As pointed out by Irawan et al (2000), an increase in the share of formal sector employment also indicated an improvement in the level of development achieved.

Figure 2.4 Real Average Wage and Nominal Average Wage of Paid Employment



Source: Calculated from the Indonesian Labour Foce Survey (Sakernas)

The nominal average wage (including bonuses, regular allowances and overtime payments) of paid employment in Indonesia was relatively low at around Rp. 800,000 or around US$ 80 per month in 2003 (see figure 2.4), increasing by about 15%-20% per year. On the other hand, the real average wage also increased steadily at around 6% per year, except during the 1997-1998 crisis when it dramatically decreased by more than 20% per year. Compared to the other South East Asian countries, the real wage in Singapore and Malaysia increased much faster than the real wage in Indonesia, while in contrast, the Philippines experienced a decrease in the real wage during the 1990s (Irawan et al, 2000).

Table 2.4. Real Average Monthly Wage by Sector of Activity (Rupiah), 1996-2003

Sector	1996	1997	1998	1999	2000	2001	2002	2003
Agriculture	58,594	61,314	57,004	52,221	55,750	82,602	88,395	93,230
Mining	167,700	177,720	201,575	166,273	173,056	206,872	242,654	222,076
Manufacturing	105,797	117,432	85,290	86,514	102,680	124,230	130,996	135,313
Electricity	165,158	210,640	148,926	159,395	156,966	203,702	200,086	215,326
Construction	115,380	125,122	93,023	94,179	106,126	121,590	134,213	138,916
Trade	113,485	118,995	93,440	95,587	98,604	115,327	123,827	135,087
Transportation	143,222	150,196	119,472	115,709	137,815	160,669	161,240	167,396
Finance	230,867	213,852	174,228	178,624	218,035	255,349	229,016	246,087
Services	130,818	145,603	111,487	120,843	139,916	172,619	175,266	182,253

Source: Calculated from the Indonesian Labour Force Survey (Sakernas)

Comparing gender, the real wage of female workers increased much faster than the real wage of male workers (Irawan et al, 2000). This evidence implies that the wage differences between female workers and male workers tend to become smaller due to an improvement in education attainment among female workers and a reduction in discrimination, particularly for uneducated female workers (Feridhanusetyawan et al, 2001). However, Irawan et al (2000) noted that, on average, male workers still earned a wage 1.5 times higher than female workers. In addition, comparing sector of activities, the real average wage is highest in the finance and mining sectors, while the lowest real average wage is found in the agriculture sector (see table 2.4). In 2003, the real average wage in finance and mining sectors was more than Rp. 200,000 per month, while in agriculture sector was less than Rp. 100,000 per month.

CHAPTER III

MINIMUM WAGE POLICY IN INDONESIA

3.1 Minimum Wage Policy in Practice

The minimum wage policy in Indonesia was firstly introduced at the beginning of the 1970s (Rama, 2001 and Suryahadi et al, 2003). Although it has a long history, the implementation was not effective in the earlier periods. In these periods, the minimum wage was set much below the wage equilibrium level, suggesting that the minimum wage was not binding for most workers (Sugiyarto and Endriga, 2008). In addition, Sugiyarto and Endriga (2008) pointed out that minimum wages were relatively unenforced and used only for symbolic purposes.

The minimum wage began to be used as an important instrument for labour market policy by the Indonesian government at the end of the 1980s, as a result of international pressure relating to the evidence of violation of international agreed labour standard in Indonesia, particularly in the export-oriented sector (Rama, 2001 and Suryahadi et al, 2003). Specifically, a well-known United States labour-intensive multinational firm operating in Indonesia in that period had been complained about by the United States trade union organization (the AFL-CIO) and some international human right activists about their low wages and poor working conditions (Gall, 1998). In this case, the international pressure created a "social clause", under General Scheme Preferences (GSP), which suggested rejecting a product from developing countries, including Indonesia, where labour standards remained insufficient (Suryahadi et al, 2003).

In practice, this condition forced the Indonesian government to become more concerned about their labour market policy, including the minimum wage, by increasing the minimum wage level three-fold in nominal terms (or two-fold in real terms) at the end of the 1980s in order to bring it in line with the cost of the Minimum Physical Needs (the so-called KFM or Kebutuhan Fisik Minimum) (see Suryahadi et al, 2003, and Rama, 2001). The KFM was measured by the cost of minimum consumption packages, including food, housing, clothing, and selected other items for a single worker in a month (Sukatrilaksana, 2002).

The KFM measure was then revised in 1996 by a wider range of consumption packages and recognized as the Minimum Living Needs (the so-called KHM or Kebutuhan Hidup Minimum) in order to generate a higher standard of living. According to the Minister of Manpower Regulation No.61/1995, the KHM is measured by a more detailed consumption package of 43 items, consisting of 11 items in the food group, 19 items in the housing group, 8 items in the clothing group, and 5 items in the selected other items group, which costs 15% to 20% more than the KFM in Rupiah terms.

According to the Ministry of Manpower Regulation No.1/1999, the minimum wage in Indonesia is defined as: "*the lowest monthly wage that consists of a basic salary and a regular allowance*" (Widarti, 2006). Besides the basic monthly salary, therefore, the minimum wage should include a regular allowance if it is offered by the employer. A regular allowance is an allowance that is given regularly without considering workers' attendance or output, such as regular family allowance and an allowance based on the work tenure.

The minimum wage in Indonesia is set based on the monthly terms (not the hourly terms like in many developed countries). Typically, the Indonesian minimum wage is set for full-time workers with a standard of 40 hours worked per week or about 173 hours worked per month (see Rama, 2001). However, the minimum wage is flexible and can be adjusted for part-time workers who work less than 40 hours per week on a pro-rata basis. In addition, the minimum wage policy is legally applied to all paid employment without considering firms' size and sector of activity, while self-employment and unpaid family workers are not covered by the minimum wage policy.

Based on the Ministry of Manpower Regulation No.1/1999 (see Widarti, 2006), the main objectives of the minimum wage policy in Indonesia are:

> *(1) to materialize a decent income for workers; some considerations are taken into account, including raising the welfare of workers without ignoring companies' productivity and its advancement as well as a consideration of general economic conditions*
>
> *(2) determination of a realistic regional (and sectoral) minimum wage should take into account aspects such as a company's capability to pay, the conditions of the sector in which the company operates and the regional economy in which the firm is located; it is also necessary to determine regional (and sectoral) minimum wage.*

These objectives indicate that the minimum wage level is not only considered as a wage floor for workers who are low-paid but also as an instrument to increase the welfare and standard of living for all workers (Manning, 2003a). However, besides workers' welfare, some considerations should also be taken into account in setting the minimum wage level, such as maintain companies' productivity and sustainable national (and regional) economic conditions (Hendrani, 2002).

The minimum wage level in Indonesia is generally set provincially. Before 2001, in the centralization era, the central government (in this case the Ministry of Manpower) determined the level of each provincial minimum wage based on the recommendation from the provincial (regional) government, while after the decentralization era (after 2001) the regional government has the power to set their minimum wage level. Before decentralization, provinces mainly had just one level of the minimum wage that was applied throughout the entire region, but after the decentralization era, several minimum wages (sub-minimum wage) are allowed to exist for different local districts/cities (lower level region) within a province and, in some cases, for specific sectors of activity, as long as they are not below the provincial minimum wage level (Suryahadi et al, 2003). In practice, four provinces in Java and Bali (West Java, Central Java, East Java, and Bali) have their own local district and city minimum wages besides their provincial minimum wage, while provinces outside Java tend to set only one minimum wage level within a province. More detail about minimum wage setting during the decentralization era will be discussed in the next section.

The compliance with the minimum wage policy in Indonesia, and also in most developing countries, is likely to be low. In Honduras, for example, 32% of total employment is paid below the minimum wage level, while in Costa Rica, more than 25% of full-time paid employees are paid below the minimum wage level (Gindling and Terrell, 2007). In Indonesia, in 2003, more than 18% of paid employees in urban areas are paid below the minimum wage level, while in rural areas more than 29% of paid employees are paid below the minimum wage level (see table 3.1 below).

As pointed out by Rama (2001), there are two main reasons for non-compliance with the minimum wage policy. Firstly, there is lack of enforcement and weak control by the government particularly on the firms who fail to comply with the policy

(Suryahadi et al, 2001). Although the minimum wage policy is applied to all paid employment without considering firms' size and sector of activity, the focus of the enforcement by the government is still limited to the large and medium enterprises and workers living in urban areas. Therefore, it is not surprising that many small enterprises and workers who are living in rural areas are still paid below the minimum wage because of lack of enforcement and ineffective labour unions in that group of workers. As pointed out by SMERU (2003) and Rooney and Anggriani (2006), control from the government officers for the minimum wage compliance is usually taken by regular inspection to the companies every six months. Companies also need to provide regular reports every 3-6 months for their minimum wage compliances to the Ministry of Manpower office. In addition, the minimum wage compliances can also be checked from the data of employees' that join the National Social Security Program (the so-called Jamsostek). Jamsostek is the social security scheme for private sector workers that is mainly sponsored and administered by the government, covering worker injury benefits, death benefits, retirement benefits, and healthcare benefits (Arifianto, 2004). In practice, as pointed out by Arifianto (2004), employers have to contribute to this scheme by between 7-11% of the total wages paid to their workers, while workers have to contribute about 2% of their wages. However, this scheme covers only workers in the formal sector and does not cover workers in the informal sector and workers employed by small businesses.

Moreover, in practice, the government has never issued effective sanctions for those employers who continue to pay their workers below the minimum wage (SMERU, 2003). It seems that government still tolerates them in order to avoid lay-offs and an increase in the unemployment rate. Although there is no detailed information on the number of minimum wage violations in Indonesia, Gall (1998) stated that only 0.15% of the 108,332 violation cases including health and safety provisions and the minimum wage policy violations reported to the Indonesian Ministry of Manpower office between 1985 and 1990 got penalties for their violation. However, as noted above, the minimum wage was still not effective during that period. The minimum wage started to be used an important instrument for labour market, as the focus of this study, at the end of the 1980s.

Based on the new regulation (after decentralization era), the penalties for non-compliance range from Rp. 10 million to Rp. 100 million (about US$ 1000 to US$ 10,000), while before new regulation it is relatively low at around US$ 50 (Rama, 2001 and Manning, 2003). However, Rama (2001) pointed out that penalties or economic sanctions are not effective in Indonesia as bribes and corruptions are sometimes still found in practice. As an alternative, publicity and blacklisting of the companies that violate the regulation are also used by the government as a mechanism to enforce the minimum wage (Rama, 2001).

The second reason for non-compliance is that, based on government regulation, employers might propose a temporary waiver if they are unable to comply with the minimum wage regulation. However, the requirements to obtain a temporary waiver tend to be difficult and costly, particularly for medium and small enterprises because it requires a financial audit from a public auditor (Suryahadi et al, 2001). In practice, Rama (2001) confirmed only about 135 of waiver requests per year in Indonesia from more than 20,000 firms in the manufacturing sector, suggesting that the number of temporary waivers proposed by the companies is not significant.

Table 3.1. Compliance with the Minimum Wage (%), 1996-2003

	1996	1997	1998	1999	2000	2001	2002	2003
National (Aggregate)								
Less than MW[a]	38.20	33.79	33.43	30.78	29.62	24.72	24.78	21.53
Fraction at MW[b]	6.44	5.86	5.42	5.09	5.06	4.48	5.05	3.75
More than MW[c]	55.36	60.35	61.15	64.13	65.32	70.80	70.17	74.72
Urban								
Less than MW	28.40	24.41	26.05	24.13	23.19	21.59	21.75	18.19
Fraction at MW	6.32	5.53	4.91	4.77	4.95	4.02	4.95	3.69
More than MW	65.28	70.06	69.04	71.10	71.86	74.39	73.30	78.12
Rural								
Less than MW	49.20	44.42	42.29	39.24	39.08	31.20	31.72	29.51
Fraction at MW	6.57	6.23	6.03	5.51	5.21	5.42	5.28	3.89
More than MW	44.23	49.35	51.68	55.25	55.71	63.38	63.00	66.60

Note : [a] Less than MW is the fraction of workers which earn below the minimum wage level
[b]Fraction at MW is the fraction of workers which earn around the minimum wage level (using 5% rounding approximation)
[c] More than MW is the fraction of workers which earn above the minimum wage level

Source : Calculated from Sakernas

Although the compliance is relatively low, there is a tendency for it to increase substantially in medium and large-scale establishments when labour unions become effective, especially after the political liberalization which followed the economic crisis and downfall of Soeharto's political dictatorship in 1998. Before 1998, there was a strong political campaign during President Soeharto's heavily centralized era to prevent labour unions as a crucial part of regional labour market policy, allowing only one pro-government labour union (SPSI) to exist (Rama, 2001 and Suryahadi et al, 2003). In the public sector, all of the employees must also be a member of corps of labour organization (the so-called KORPRI) created by the government. In general, the employees do not have collective bargaining and representative functions during that period (Gall, 1998). After the new regime, in contrast, the industrial relations system now becomes more decentralized where employers and employees have its representative functions. After 2001, for example, more than 141 national labour unions exist with more than 11,000 registered members (SMERU, 2003). However, in practice, the union is still mostly found in the large and medium enterprises and is rarely found in the small enterprises.

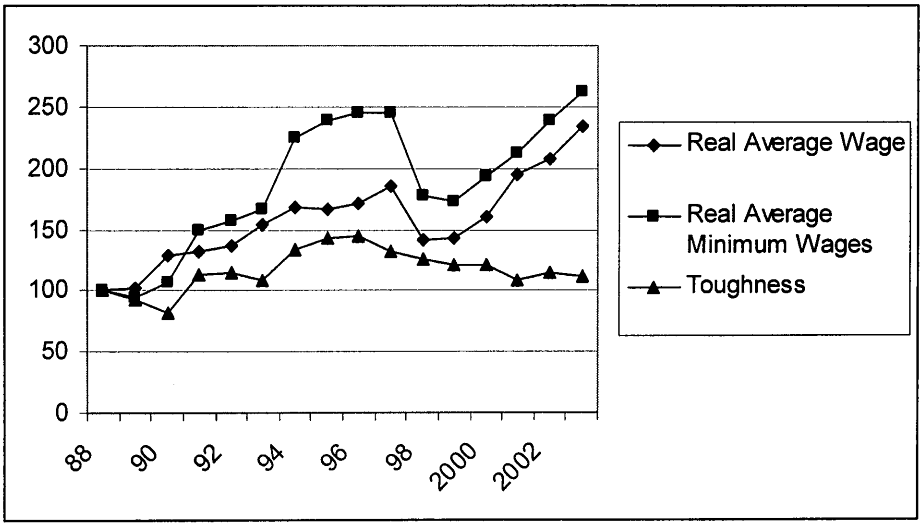
As presented in table 3.1, a decline in the percentage of earnings below the minimum wage after 1996 was one indication that the minimum wage has become more binding in Indonesia. When workers are separated into different areas, it becomes clear that the minimum wage mostly affects urban areas. The high percentage of workers who earn below the minimum wage level in rural areas suggests that workers in rural areas are not greatly affected by the minimum wage, given the low compliance and lack of enforcement in those areas. On the other hand, urban areas, where medium and large-scale establishments are mostly situated, are the most likely to see compliance with the minimum wage regulation[2]. In consequence, if the goal of the minimum wage is to reduce poverty, this is unlikely to be an effective tool due to the fact that poverty in Indonesia is largely in the rural and informal sectors (Islam, 2002), which are not covered by the minimum wage.

Compared to other countries, table 3.1 suggests that the fraction of workers which earn near or at the minimum wage level (the so-called fraction at) is relatively small. In Brazil, the fraction at the minimum wage level is 12% (Lemos, 2004c), while in Thailand, it is more than 20% (ILO, 1999). One possible reason is the fact that the minimum wage does not act as the exact wage floor in Indonesia. According to the Ministry of Manpower Regulation No.01/1999, it is important to note that the minimum wage level can only be applied to workers who have worked for less than one year. In other words, if the duration of work is more than one year, the company should pay a salary greater than the minimum wage level, although it is not clear by how much. This evidence supports Manning's (2003a) analysis that the Indonesian

[2] Suryahadi et al's (2001) survey found that only 4.9% workers in large-scale establishment are paid below the minimum wage level. In contrast, 63.3% and 30.4% workers are paid below the minimum wage level in small and medium scale establishments respectively.

minimum wage policy is likely to be considered as a tool or instrument for raising the workers' standard of living rather than considered as a floor to the wage levels. Unfortunately, there is no information in our labour force data set about the job tenure. This information, in practice, will be important in order to indicate whether a differential influence between workers employed less than a year (who are paid the exact wage floor in Indonesia based on the regulation) and workers employed more than a year exists in Indonesia.

Figure 3.1. Trends in Real Average Wage, Real Average Minimum Wages and Toughness, 1988-2003 (1988=100)



Source: Computed from Sakernas

In summary, figure 3.1 shows some trends in the real average wage, the real average minimum wage and the ratio of real average minimum wage to real average wage in Indonesia (the so-called toughness). It shows that before the international pressures of the early 1990s, the increasing trends of the minimum wage were somewhat below the rising trend in average wages. After 1990, there is a constant increase in real terms, indicating that the minimum wage has become an important labour market policy in Indonesia. However, given the steep depreciation of the Rupiah in the wake of the

1997 financial crisis, real average minimum wages have fallen to their lowest level for almost a decade. The surge in inflation in 1998 decimated the level of the minimum wage. Therefore, in real terms, they actually fell significantly. On the other side, toughness fluctuated more slightly. Because real average minimum wages rose faster than real average wages, toughness had a tendency to increase after 1990. However, after the crisis in 1997, toughness declined slightly and stayed at around the same point.

3.2 Minimum Wage Fixing in the New Regime (Decentralization Era)

Since 2001, as part of a political regime changing from centralization to greater decentralization, the power to set the minimum wage level has also been transferred to the provinces and local district governments (the lower level of government), who collaborate with the wage commission at a regional level. Each wage commission is comprised of a regional manpower office, employer, labour union representatives, and some expert advisors (Manning, 2003a). The main objective of this decentralization policy is to gain economic effectiveness, efficiency and equitable access to public services (Sugiyarto and Endriga, 2008)[3]. In addition, local governments are also assumed to understand more about the problems and conditions of their region rather than the central government.

Based on new regulation, the government at the provincial level sets a minimum wage floor for the entire region, while the local districts and municipalities (the lower level government) have an option to follow or set the minimum wage above the provincial

[3] SMERU (2003) also argued that decentralizing the power to set the minimum wage level was also aimed at sharing the risks of negotiating with the labour unions in each region, such as big demonstrations when the minimum wage changes, by delegating the power to the lower level government.

wage level, but not lower than the provincial minimum wage level. As pointed out by Manning (2003a), the implementation varies across provinces. Some provinces, such as Greater Jakarta and most of the provinces outside Java, use their provincial minimum wage level across their districts and municipalities. On the other hand, some other provinces, including West Java, East Java, Central Java, and Bali allow the variation of minimum wages level across cities and municipalities. Although it has officially stated in the new regulation, in practice, the minimum wage setting across districts and municipalities is still under debate in Indonesia. Besides making the minimum wage fixing and its implementation more complicated, some Indonesian experts, including Widianto (2003), have criticized this in that it will increase the opportunity for corruption at the lower level of government and make enforcement more difficult[4].

According to the new government regulation after the decentralization era, as pointed out by Hendrani (2002), in determining the level of the minimum wage, consideration must be given to:

(a) the cost of minimum basic living needs (KHM);

(b) the consumer price index;

(c) the capability, growth and continuation of the company;

(d) the rate of the minimum wage in neighbouring areas;

(e) labour market conditions;

(f) economic growth and per capita income.

---

[4] If there are more than 300 local districts and municipalities, it is possible that Indonesia will have more than 300 different levels of the minimum wage across regions.

However, there are still no clear and detailed guidelines on how the criteria might be collected across regions. In determining the cost of KHM, for example, the assessment varies across regions depending on the type of market visited and the quality and the expertise of the wage commission (Manning, 2003a). In addition, in most areas, there is a lack of reliable data of these other criteria (besides the cost of KHM) at regional level. Therefore, in practice, the cost of minimum basic living needs (KHM) (and rate of minimum wages in neighbouring areas in some areas) is still the main consideration used to set up the minimum wage level (see for example Hendrani (2002) study of West Java).

Table 3.2 confirms that the Indonesian provincial minimum wages in 2003 were set primarily on the basis of the KHM. It can be seen from table 3.2 that in 2003 more than a half of all provinces had a ratio of the minimum wage to the KHM at around 90%-110%. Only a few provinces had a ratio below 70%, including Maluku, Bengkulu, and Riau. The exception was found in 1999, shortly after the major economic crisis in 1997-1998, when all of the minimum wages were below the KHM, indicating the decline of worker welfare in that period. As presented in table 3.2, the highest ratio of the minimum wages to the KHM during this period was only 80.5% in Sumatera Utara and the lowest one was 55.6% in Aceh.

Table 3.2. Nominal Minimum Wages and KHM by Provinces, 1999 & 2003

Provinces	1999			2003		
	MW (Rp)	KHM (Rp)	Ratio (%)	MW (Rp)	KHM (Rp)	Ratio (%)
N. Aceh	171,000	307,603	55.6	425,000	520,900	81.6
Sumatera Utara	210,000	261,000	80.5	505,000	455,996	110.7
Sumatera Barat	160,000	251,712	63.6	435,000	419,650	103.7
Riau	242,000	355,515	68.1	437,500	647,403	67.6
Jambi	150,000	215,463	69.6	390,000	448,857	86.9
Sumatera Selatan	175,500	251,586	69.8	403,500	403,272	100.1
Bengkulu	150,000	210,162	71.4	330,000	505,000	65.3
Lampung	160,000	220,500	72.6	350,000	403,925	86.6
DKI Jakarta	231,000	351,263	65.8	631,554	746,749	84.6
Jawa Barat	208,750	330,949	63.1	320,000	320,000	100.0
Jawa Tengah	153,000	235,750	64.0	340,400	387,121	87.9
DI Yogyakarta	130,000	227,064	57.3	360,000	364,722	98.7
Jawa Timur	170,500	251,371	67.8	274,000	260,659	105.1
Bali	176,500	288,000	61.3	410,000	433,640	94.5
N.T.B	145,000	257,150	56.4	375,000	395,831	94.7
N.T.T	143,000	237,425	60.2	350,000	349,612	100.1
Kalimantan Barat	175,000	255,707	68.4	400,000	439,918	90.9
Kalimantan Tengah	195,000	335,442	58.1	425,000	470,000	90.4
Kalimantan Selatan	166,000	233,721	71.0	425,000	409,512	103.8
Kalimantan Timur	194,000	317,704	61.1	540,000	860,683	62.7
Sulawesi Utara	155,000	248,706	62.3	495,000	481,780	102.7
Sulawesi Tengah	150,000	240,000	62.5	410,000	481,670	85.1
Sulawesi Selatan	148,000	257,035	57.6	415,000	436,000	95.2
Sulawesi Tenggara	160,000	254,250	62.9	390,000	474,739	82.1
Maluku	180,000	223,968	80.4	370,000	562,222	65.8
Papua	225,000	331,579	67.9	600,000	725,000	82.8
AVERAGE	174,009.6	267,331.7	65.1	415,652.1	477,110	87.1

Note: Nominal Minimum Wage (MW) and KHM are in Rupiah
Ratio represents the ratio of the nominal minimum wage to the KHM
Source: Indonesian CBS and Sukatrilaksana (2002)

In practice, the transfer of power in determining the level of the minimum wage to the regional government has had a big effect on minimum wage trends. In recent times, the combination of local pressures and stronger labour unions at regional level has significantly contributed to a large minimum wage increase in most Indonesian provinces. On average, nominal minimum wages increased by 30% per year in 2001 and 2002 (see Suryahadi et al, 2003)[5]. Although this increase is based primarily on the increase of the cost of KHM, this all occurred against the slow growth of an economy which was still struggling to recover after the major economic crisis in 1997-1998.

[5] There is even evidence that an increase in minimum wage is far above the regional inflation, such as in West Java and East Java (Manning, 2003a).

Compared to the other Asian countries with similar stages of development, the average minimum wage level in Indonesia is only lower than the minimum wages in Philippines and Thailand, but it is relatively higher than the minimum wages in Vietnam, Cambodia, Sri Lanka, Pakistan, and Bangladesh (Manning, 2003a).

This condition suggests that using only the cost of KHM as the main benchmark in determining the minimum wage level might not be enough without other considerations. Some Indonesian experts criticized the idea that the regional government may be more willing to support a populist approach to economic policy and mainly set the minimum wage level based on workers' needs, without considering other economic factors (Suryahadi et al, 2003 and Widarti, 2006). In practice, there is little consideration of employment conditions or international competitiveness which both harm many employers. This condition clearly indicates the need for better understanding of how the increase in the minimum wage level will affect employment, making this study an important policy evaluation.

In addition, the minimum wage level, based on new regulation, should be set at least 60 days before the effective date (Hendrani, 2002 and Widarti, 2006). The effective date of the minimum wage policy is from 1st January and it will be reviewed each year. The dissemination of the minimum wage information is usually through the labour union and the company's management. Otherwise, the dissemination is also occasionally informed through mass media, such as television, radio, and newspaper (Widarti, 2006).

CHAPTER IV

THEORETICAL FRAMEWORK

This chapter reviews the standard theoretical framework regarding the effect of minimum wages on employment[6]. Firstly, it discusses the standard competitive model assuming labour is homogenous and one unit of labour is a perfect substitute for another. According to this model, it is suggested that an increase in minimum wage that has a positive impact on the wage level will reduce employment. The standard competitive model is then extended using the two-sector model considering incomplete coverage of the minimum wage policy. In practice, the two-sector model might be more relevant for Indonesia and generally developing countries, given a high proportion of workers in the uncovered sector, providing a complete picture of the impact of minimum wage on employment. In contrast, the standard competitive model is more suitable for the countries where minimum wage coverage is complete. As an alternative, this chapter also reviews the monopsony model where the minimum wage might not have a negative impact but a positive impact on employment. Contrary to the two-sector model which was more likely to be found in developing countries, the evidence of monopsony was likely to be found in developed country cases (see for example Dickens et al, 1994 and 1999; and Card and Krueger, 1994).

[6] In this chapter, employment is measured by the number of workers rather than number of hours worked although their analysis might not change if number of hours worked is used instead. The effects of minimum wage on hours worked will be discussed specifically in chapter 7.

4.1 The Standard Competitive Model

The standard competitive model assumes that labour is homogenous and one unit of labour is a perfect substitute for another (with similar skills and labour services) (Jones, 1997). Using a profit-maximisation approach, employers will hire employment until their marginal cost equals their marginal revenue product of labour. In the competitive market, the marginal cost is simply the wage level *w(N)*. Assume the firm has a total revenue *R(N)*, therefore, the firms maximise their profits at the difference between the total revenue (R) and the total cost of labour ($w(N)$) given by:

$$\Pi = R(N) - w(N) \qquad (4.1)$$

By using the first order conditions, we can see that employers maximise their profits by employing their workers where the marginal cost (w') is equal to the marginal revenue product of labour (MRP) (Hinnosaar and Room, 2003) given by:

$$MRP - w' = 0 \qquad (4.2)$$

where MRP can be represented as the firm's marginal product of labour (MP_L) times their marginal revenue (MR). If the minimum wage is set above the equilibrium wage level, the marginal cost of labour will increase above the marginal revenue, leading to a new level of equilibrium with a lower level of employment.

Figure 4.1 presents the equilibrium level for wage and employment based on the standard competitive model. The labour demand curve is downward sloping representing the marginal revenue product of labour (MRP). This diminishing marginal productivity of labour implies that the contribution to output (productivity) increases at a decreasing rate when employment increases, assuming that the other inputs are constant. On the other hand, the labour supply curve is upward sloping showing the alternative earnings received by workers. The equilibrium of the competitive wage rate and employment is then simply determined by the interaction between labour demand (D) and labour supply (S). As presented in figure 4.1, therefore, the wage rate equilibrium is at W_0, while E_0 is the number of workers employed.

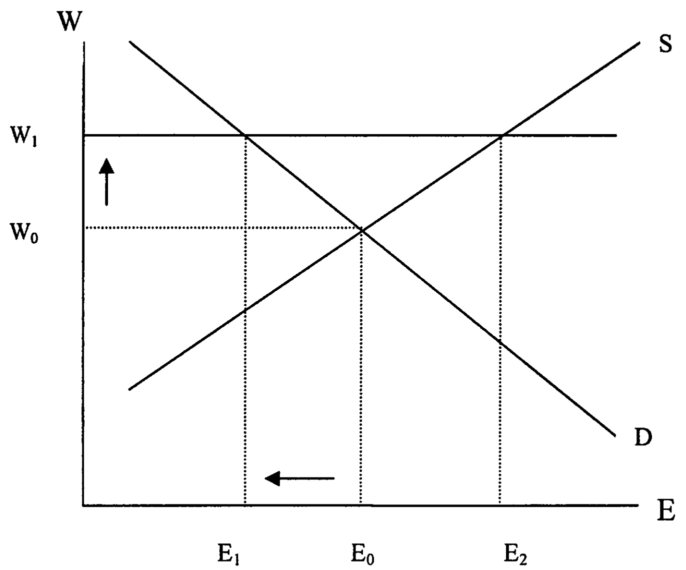


Figure 4.1
Minimum Wage in the Competitive Market

Suppose the minimum wage is set above the equilibrium level, say at W_1. This condition generates an excess supply of labour, suggesting that only E_1 will be employed with E_2 available workers. This excess implies that employment will decline from E_0 (the equilibrium level) to E_1. E_1 also illustrates the new equilibrium level of employment after the minimum wage changes in the competitive market. However, if minimum wage is set below the equilibrium level (below W_0), it would not be effective as the wage rate and employment equilibrium will remain at W_0 and E_0.

In practice, the excess supply of labour (E_2-E_1) is larger than the reduction in employment (E_1-E_0) because it includes not only workers who are displaced or affected by minimum wage, but also people who were previously not in the labour market and have been encouraged to enter the labour market by the higher minimum wage level (Filer et al, 1996). The more elastic labour demand, then the more employment is displaced or affected by minimum wage.

In the countries where minimum wage coverage is complete or compliance is high, the excess supply of labour (E_2-E_1) can simply be viewed as unemployment. However, in the case of developing countries, with limited access to the unemployment benefits and incomplete coverage of minimum wage, workers who are affected by minimum wage do not always become unemployed; some will go to work in the uncovered sector (Jones, 1997). Therefore, the two-sector model of covered and uncovered sectors described below might be more relevant for developing countries rather than the standard competitive model, showing a complete analysis of workers in the covered and uncovered sectors.

4.2. The Two-Sector Model

As mentioned above, the standard competitive model is suitable for the countries where minimum wage coverage is high. However, this model might not be complete for developing country cases, given a high proportion of workers in the uncovered sector. The extension of the standard competitive model is given by the two-sector model firstly constructed by Welch (1974) by considering incomplete coverage of minimum wage. This model basically assumes that there are two sectors in the economy, one that is covered by the minimum wage policy (the so-called covered sector) and one that is not covered by the minimum wage policy (the so-called uncovered sector) with perfect mobility across two different sectors. In the absence of a minimum wage, these two sectors are assumed to be paid at the same wage level W_0.

Suppose there is an imposition of a minimum wage in the covered sector that is higher than the equilibrium wage rate W_0. The covered sector jobs then become preferable to the uncovered sector jobs, suggesting that more people become willing to work in the covered sector. In other words, an imposition of a minimum wage potentially creates an excess supply of labour in the covered sector. According to Welch (1974), the probability of finding a job in the covered sector (*P*) is therefore given by:

$$P = \frac{D_c(W_m)}{S(W_m)} \qquad (4.3)$$

where $D_c(W_m)$ is the demand for covered sector jobs and $S(W_m)$ is the aggregate supply of labour.

Based on the two-sector model, this excess supply of labour in the covered sector potentially generates a displacement effect for employment in the covered sector into the uncovered sector or withdrawal from the labour market. Specifically, this effect not only shifts or affects workers who were previously in the covered sector but also moves people who were previously not in the covered sector and have been encouraged to enter the covered sector by the minimum wage imposition. This evidence is illustrated by the shift in the supply curve of the uncovered sector outward from S_0 to S_1 in figure 4.2.

Following Welch (1974), the supply of labour in the uncovered sector ($S_u(W_0)$) after the minimum wage imposition in the covered sector can be specified in general form as follows:

$$S_u(W_0) = S(W)(1-P) \qquad (4.4)$$

where $S(W)$ is the total supply of labour. In consequence, the uncovered sector employment will increase (from E_0 to E_1 in figure 4.2) and wages paid to the workers in the uncovered sector will decrease below the original equilibrium level (from W_0 to W_1 in figure 4.2). At the new equilibrium wage level, W_1, demand in the uncovered sector at W_1 ($D_u(W_1)$) is then given by:

$$D_u(W_1) = D_u(W_0)(1+\eta\omega) \qquad (4.5)$$

where $D_u(W_0)$ is the demand of labour in the uncovered sector before the minimum wage imposition, η is the elasticity of labour demand, which is presumed the same as for the covered sector, and ω is the proportionate wage reduction (or given as $\omega = (W_1-W_0)/W_0$).

On the other hand, the supply of labour in the uncovered sector, at the new equilibrium wage ($S_u(W_1)$), is given by:

$$S_u(W_1) = S(W)(1+\varepsilon\omega)(1-P) \qquad (4.6)$$

where ε is the elasticity supply of workers in the uncovered sector. Equating the sum of the demand and supply changes related with the ω proportionate wage reduction and the supply shifts induced by the minimum wage imposition in the covered sector gives:

$$\omega = \frac{-cw_m}{1-c+\varepsilon w_m} \qquad (4.7)$$

where c is the proportion of workers employed in the covered sector and w_m is the proportion by which wage changes as the minimum wage imposition in the covered sector.

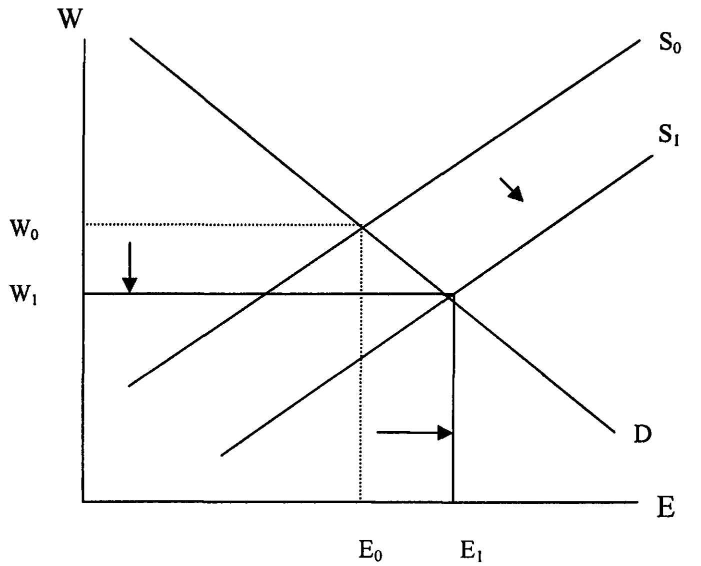


Figure 4.2
Minimum Wages Effects in the Uncovered Sector

In Indonesia, the distinction between the covered and uncovered sectors depends on the category (status) of employment. As mentioned above, in Indonesia, paid employment is the category of employment legally covered by the minimum wage policy, while self-employed and unpaid family workers are the category of employment not covered by the minimum wage policy. Although the proportion has been increasing, paid employment in Indonesia is only 39% of total employment with more than 60% of them in urban areas. Given that there are no unemployment benefits provided by the Indonesian government, if there is some decline in the covered sector, it can be predicted that workers are likely to be displaced to the uncovered sector. In addition, Feridhanusetyawan and Gaduh (2000) argued that the labour market in

Indonesia is flexible enough in supporting labour mobility from one sector to the other sector if there is a contraction in the covered sector. One of the examples of flexible labour mobility in Indonesia is the role of the urban informal sector as a "safety valve" for employment during the crisis of 1997-1998.

In addition, Mincer (1976) and Gramlich (1976) extend the standard two-sector model by considering that workers displaced from the covered sector will not automatically enter the uncovered sector when the wage rates offered in the uncovered sector are lower than their reservation (expected) wages (the so-called two-sector model with queuing for covered-sector jobs). These workers, specifically, will wait (queue) for the covered sector (as unemployed) because this sector generally has a higher expected wage than the uncovered sector. However, the probability of getting a job in the covered sector in practice is lower than the probability of getting a job in the uncovered sector. In this case, Gramlich (1976) specified the expected wage as follows:

$$E(W) = (P + r\,(1 - P)\,W_m) \tag{4.8}$$

where P is the probability of being employed in the covered sector, r is income replacement rate for unemployment benefits, and W_m is the wages in the covered sector. Specifically, P depends on the number of unemployed queuing for the covered sector jobs (U) relative to the covered sector employment as follows:

$$P = \frac{1}{1 + \dfrac{\alpha U}{D_c(W_m)}} \tag{4.9}$$

According to this model, the total supply of labour therefore consists of covered and uncovered sectors employment and unemployed, which is given by:

$$S(W) = D_c(W_m) + D_u(W_l) + U \tag{4.10}$$

Assuming demand elasticities in covered and uncovered sectors are equal, total employment will be a function of proportion of workers employed in the covered sector (c), elasticity of demand for labour (η), elasticity of supply for labour (ε), unemployed parameter (α), and the wages in the covered sector (W_m), which is given by:

$$\ln E = \frac{c(\varepsilon + \frac{1}{\alpha})\eta}{\varepsilon + \frac{c}{\alpha} - (1-c)\eta} \ln W_m \tag{4.11}$$

Solving for the unemployment rate (the ratio of unemployed to supply of labour), this is given by:

$$\frac{U}{S(W_u)} = \frac{c(\varepsilon - \eta)}{\varepsilon\alpha + c - \alpha(1-c)\eta} \ln W_m \tag{4.12}$$

The limitation of this two-sector model with queuing for covered sector jobs developed by Gramlich (1976) and Mincer (1976) is that it assumes workers cannot search for covered sector jobs when they are employed in the uncovered sector (Brown et al, 1982). If covered and uncovered sectors are separated geographically, workers in uncovered sectors are unlikely to search for covered sector employment. However, the covered and uncovered sectors are usually separated based on their employment category (employment status), such as in Indonesia, suggesting that uncovered sector employment (those who are interested in entering covered sector employment) are likely to search for covered sector employment when they are employed in the uncovered sector. Therefore, the unemployment rate (from the queuing for covered sector jobs) might be less than predicted. In addition, this model assumes the availability of unemployment benefits, which is not the case of Indonesia.

As a result, the simple two-sector model developed by Welch (1974) might be more relevant for Indonesia than the two-sector model with queuing for covered sector jobs developed by Mincer (1976) and Gramlich (1976).

4.3. The Monopsony Model

The monopsony model is an alternative theoretical model which might provide non-negative effect of minimum wage on employment. In this model, it is generally assumed that there is only a single (dominant) firm or buyer of labour in the labour market. Therefore, the firm has the power to set a wage level that maximises its profits (the so-called monopsony power). A higher wage paid to the workers, then, will lead to larger supply of workers (Dolado et al, 1996). In the absence of minimum wage, the marginal revenue product of labour (MRP_L) is assumed to be downward sloping representing the addition to the total revenue as a result of employing each additional worker. As a single buyer, the labour supply curve (S) is upward sloping which means that a monopsonist should have to pay a higher wage in order to attract and to employ an extra unit of labour. S also represents their average cost (AC_L) showing the average wage level that employers need to pay if they want to hire additional workers. Unlike the standard competitive model, the marginal cost of labour (MC_L) is higher than the AC_L curve because a monopsonist does not have to pay a higher wage only to the new additional worker, but also to the existing workers with at least at the same wage level.

According to the profit-maximisation approach, the firm will hire employment until their MC_L equals their MRP_L. As presented in figure 4.3, the firm therefore will maximise its profits where the MC_L curve intersects with the MRP curve. As a result, the wage rate equilibrium in the absence of minimum wage is at W_0 and the employment level is at E_0.

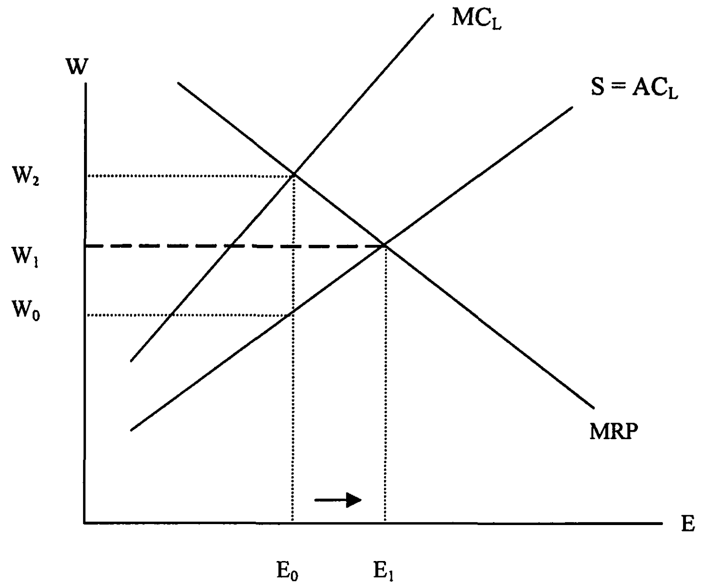


Figure 4.3
Minimum Wage in the Monopsony Market

Suppose there is an introduction of minimum wage at W_1, which is higher than the wage rate equilibrium. The minimum wage makes the marginal cost of labour (and also the labour supply curve) perfectly horizontal at W_1, suggesting that employing additional workers does not need to raise the wage as long as workers are expecting to be paid at or below the minimum wage level. This condition exists until they intersect with their original labour supply curve. After MC_L intersects its original labour supply curve, S is upward sloping (follow the original labour supply curve) suggesting that the firm needs to pay more than the minimum wage level if they want to hire additional workers than the workers who are expecting to be paid at or below the minimum wage level (Rocheteau and Tasci, 2007). This implies that the overall labour supply curve is kinked at the point where the quantity of labour is E_1. The perfectly horizontal marginal cost curve now also follows the original marginal cost curve (MC_L). The new equilibrium level after minimum wage introduction therefore becomes E_1 and W_1 where the perfectly horizontal marginal cost curve meets its marginal revenue product of labour. As a result, contrary to the standard competitive model, this condition leads to an increase in employment from E_0 to E_1 suggesting a positive impact of minimum wage on employment. However, the optimal level for the minimum wage setting that generates more employment for the firm is the intersection between MRP_L and MC_L (at W_2 level). Therefore, if the minimum wage is set above the W_2 level, similar to the competitive wage, employment will actually fall.

Dickens et al (1994) and Manning (2003b) concluded that the equilibrium level of wage and employment for monopsonist is determined by the elasticity of the MRP_L with respect to employment ($1/D$) and the elasticity of the labour supply with respect to an individual firm ($1/\delta$). The employment gain for the monopsonist is then given by $ln\ (1+ \delta) / (D+\delta)$, while the wage increase is given by $\delta\ ln\ (1+ \delta) / (D+\delta)$.

4.4 The Dynamic Monopsony Model

In reality, a single buyer of labour, such as the small town firm or the isolated employer in the outer islands, has rarely been seen in the labour market during recent years, which is mainly down to infrastructure and/or transportation improvement (Machin and Manning, 1994 and Ghellab, 1998). In addition, most minimum wage workers are likely to be found in small firms, not in a big single (dominant) firm. Relating to these issues, Machin and Manning (1994) and Manning (2003b) developed a comprehensive dynamic monopsony model which might be more relevant than the standard monopsony model as regards recent labour market analysis. As pointed out by Machin and Manning (1994) and Ghellab (1998), the main assumption of the dynamic monopsony model is, firstly, there could be several employers (firms) in the labour market indicating that there are several buyers of labour in the labour market (must not be a single buyer of labour). Secondly, workers have imperfect information about better job opportunities elsewhere offered by the other employers during the current time period, indicating their commitment to the current employer. Thirdly, it is easy to get an extra unit of labour as long as employers offer higher wages above the equilibrium level. As a consequence, consistent with the standard monopsony model, there will be a positive relationship between the wage changes and labour supply, represented by an upward labour supply curve. In other words, this condition can also be interpreted that employers have a monopsony power in the labour market.

As pointed out by Dickens et al (1994) and Manning (2003b) there are two important additional points to be considered in their model: (1) heterogeneity among monopsonist firms; and (2) interactions between monopsonist firms. Relating to heterogeneity, in practice, the effects of minimum wage on each monopsonist firm will be different depending on their productivity (the so-called demand or revenue shock) and the labour supply curve facing the employer (the so-called supply shock). Dickens et al (1994) and Manning (2003) provided three alternative regimes that might be faced by the employers, including the unconstrained regime, the supply-constrained regime, and the demand-constrained regime. They will be discussed below.

Moreover, as pointed out by Dickens et al (1994), an increase in the wage paid to the workers by a monopsonist firm will induce the other monopsonist firms to increase their wages as well, suggesting the presence of "spillover effect" or "knock-on effect" in the interactions between firms. In this case, this effect is defined as an increase in wages in a monopsonist firm caused by an increase in wages of the reference firm in the same industry. As a result, this effect will also induce higher average wages in the industry, causing an increase in aggregate labour supply in the industry as predicted by the monopsony model.

Dickens et al (1994) and Manning (2003) provide a standard theoretical model of dynamic monopsony using a profit maximisation approach. Suppose that firm i has the marginal revenue product of labour which is simply given by:

$$MRP_i = A_i N_i^{-\alpha} \tag{4.13}$$

where A_i is the firm-specific demand shock to the MRP_i, and N_i is the employment at firm i.

On the supply side, the labour supply to the firm i is given by:

$$N_i = \left(\frac{W_i}{B_i W} \right)^{\frac{1}{\mu}} .N \tag{4.14}$$

where Wi is the firm-specific wage offered, W is the average log wage across firms (the aggregate wage), B_I is the firm-specific supply shock, and N is the aggregate employment. Inverting the labour supply function to the wage equation, it takes the form:

$$W_i = W^s\,(W, N_i, B_i) \tag{4.15}$$

Taking the log-linear in the form and changing the log-linear variables by lower case gives:

$$w_i = \beta w + \delta n_i + b_i \tag{4.16}$$

suggesting that the log wage in the firm i (w_i) depends on the log average wage across firms (w), the log of firm-specific labour supply shock (b_i) and the log of employment (n).

According to the profit maximisation approach, employers will hire labour up to the point where the MRP_i is equal to the marginal cost of labour (MCL_i). Suppose, the log of MCL_i is given by ln $(1+ \delta) + w_i$. Substituting the labour supply function into the log of MCL_i, it takes the form:

$$MCL_i = \ln(1+\delta) + \beta w + \delta n_i + b_i \tag{4.17}$$

Equating the $MRPL_i$ and MCL_i provides

$$a_i - \alpha n_i = \ln(1+\delta) + \beta w + \delta n_i + b_i \tag{4.18}$$

Solving for N_i (the equilibrium level of employment) gives:

$$n_i = \frac{-\beta w - \ln(1+\delta) + a_i - b_i}{\alpha + \delta} \tag{4.19}$$

Substituting N_i to the labour supply function, the equilibrium level of wages is given by:

$$w_i = \frac{\alpha\beta w - \delta \ln(1+\delta) + \delta a_i + \alpha b_i}{\alpha + \delta} \tag{4.20}$$

As presented in the equilibrium level of wage and employment equations (equation 4.19 and 4.20), we can conclude that revenue shocks (a) positively affect wage and employment, while supply shocks (b) positively affect wage and negatively affect employment. Moreover, the change in $\frac{\delta a_i + \alpha b_i}{\alpha + \delta}$ is also defined as the wage shocks (V) because it measures the bite of the minimum wage (Manning, 2003b).

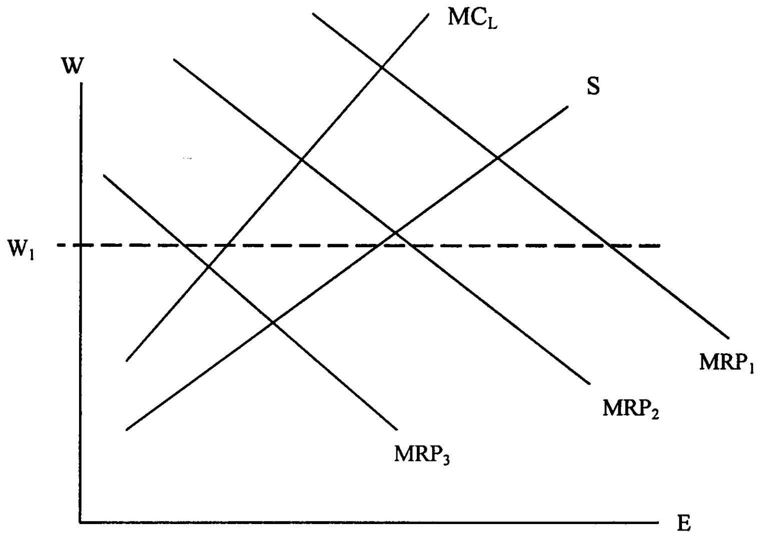


Figure 4.4
Three Regimes for the Impact of Minimum Wage

Source: Dickens (1994) and Manning (2003b)

In the presence of a minimum wage, say at w_1, as pointed out by Dickens et al (1994) and Manning (2003), there are three possible regimes for monopsonists depending on the marginal revenue product of labour (MRP_i) curve position. Firstly, the monopsonists will be in the "unconstrained regime" if the MRP_i intersects the $MCLi$ at a level of employment requiring a wage paid above the minimum wage level (see MRP_1 curve in figure 4.4). In this case, the employment level is determined by the supply curve. However, although workers are initially paid above the minimum wage level, it does not mean that the equilibrium levels of wage and employment will not change when the minimum wage is introduced. As pointed out by Dolado et al (1996), the coefficient of the average wage (β) in equations 4.19 and 4.20 will not equal zero because of the interactions between monopsonist firms that might induce the monopsonist to increase their wages perhaps through the spillover effect.

Secondly, the monopsonists will be in the "supply-constrained regime" if the MRP_i intersects the *MCLi* at a level of employment requiring a wage paid at the minimum wage level but level of employment is determined by the supply curve (see MRP_2 curve in figure 4.4 which is slightly below MRP_1 curve). The equilibrium level of employment after the minimum wage introduction is then given by:

$$n_i = \left[\frac{-\beta w - \ln(1+\delta) + a_1 - b_1}{\alpha + \delta}\right] + \left(\frac{1}{\delta}\right)V \qquad (4.21)$$

where the first term of the equation indicates the equilibrium level of employment before the minimum wage introduction, while the second term denotes the elasticity of the labour supply with respect to an individual firm (1/δ) and the wage shocks (*V*).

Thirdly, the monopsonists will be in the "demand-constrained regime" if the MRP_i intersects the *MCLi* at a wage level below the level of minimum wage (see MRP_3 in figure 4.4). The level of employment is therefore determined by the *MRP* (demand) curve. In this case, monopsonists will pay their workers at the minimum wage level, but it is not profitable to employ all workers at the minimum wage level. As noted by Dickens et al (1994), some firms still experience more employment than before minimum wage introduction, but very low productivity firms tend to reduce their level of employment. The equilibrium level of employment after the minimum wage introduction in this regime is given by:

$$n_i = \left[\frac{-\beta w - \ln(1+\delta) + a \;\; - b_1}{\alpha + \delta}\right] - \left(\frac{1}{\delta}\right)V + \frac{\ln(1+\delta)}{\varepsilon + \delta} \qquad (4.22)$$

where $\ln(1+\delta)/(\varepsilon+\delta)$ shows the standard monopsony formula for the maximal gain in employment, confirming that employment will be higher than in the competitive market (Manning, 2003a).

The standard application of this model in the international literature has been addressed, for example by Dickens et al (1994 and 1999); Machin and Manning (1994); and Stewart (2002). Although whether a country tends to have a monopsony or competitive labour market is an empirical matter, all of the empirical evidence of monopsony was likely to be found in developed countries. In developing countries, including Indonesia, there is still no empirical evidence of the existence of monopsony. In practice, almost all of the previous studies in developing countries generally supported the standard competitive and two-sector models in terms of adverse employment effects, although some studies also found no significant impact on employment (see for example Bell, 1997; Maloney and Nunez, 2001; and Arango and Pachon, 2004).

CHAPTER V

THE EFFECTS OF CHANGES IN MINIMUM WAGE ON WAGES AND EMPLOYMENT:
Regional Panel Data Analysis

5.1. Introduction

There are large numbers of studies on the effects of minimum wage on employment, particularly in developed countries. In earlier decades, most of the minimum wage studies, particularly in the United States, used aggregate time series data when examining the impact of minimum wage on employment (Brown et al, 1982). In general, teenage employment has become the focus of studies, since this sector of employment is typically at the bottom of the wage distribution and is most affected by an increase in minimum wage. As summarized by Brown et al (1982), a 10% increase in the minimum wage, on average, reduces teenage employment by between 1% and 3% using United States aggregate time series data before the 1980s. The main limitation of the time-series data studies is the difficulty in distinguishing between the minimum wage effect and the cyclical macro shocks effects that also influence the wage rates and employment (Yuen, 2003; Neumark et al, 2004; and Kawaguchi and Yamada, 2007). Time-series data are also not useful when there is relatively small variation of the minimum wage level across time in the country (Neumark and Wascher, 1992). In addition, time-series data studies are not popular in developing country studies due to data unavailability for long time periods.

In practice, there has recently been a shift from aggregate time-series data approaches into cross-sectional and panel data approaches particularly in the more recent developed country studies (Neumark and Wascher, 2004). In contrast to time-series data studies, the cross-sectional data studies in the United States have focused on the effect of minimum wage on employment using variations associated with the difference in state and federal minimum wage policy (Ghellab, 1998). According to Brown et al's (1982) literature review, although the estimates using cross-sectional data on average are wider than the estimates of time-series data studies, most of the studies are still consistent with the standard competitive model prediction that an increase in the minimum wage is likely to decrease teenage employment. One of the limitations of the pure cross-sectional data approach is the difficulty in measuring the minimum wage effects when the single minimum wage level exists at one point in time across individual workers (Brown et al, 1982).

As an alternative, more recent minimum wage studies have applied the methodology of using both panel data and pooled time-series cross-sectional data approaches. Besides providing greater numbers of observations and minimum wage measure variations, these methodologies allow specific region (or industry) and year effects as separate effects to the minimum wage variable, providing a "cleaner evaluation" of the minimum wage effects from any specific region and year effects (Neumark and Wascher, 1992).

Using an aggregate provincial panel data set, this chapter specifically focuses on two main objectives. The first objective is to examine the effects of changes in minimum wage on the average wage paid to the worker in Indonesia. As pointed out by Burkhauser et al (2000), the effects of minimum wage on employment can only be found if there is a significant effect on the wage paid to the worker. Similar to Lemos

(2004d), the effect of the minimum wage on the wage rate will also be explored across each level of the wage distribution. If the minimum wage is effectively enforced, we might expect that the distribution of wage becomes more compressed, indicated by the largest effect at the bottom part of the distribution. (see for example Dickens et al, 1999 and Lemos, 2004b). However, it is interesting to note that some minimum wage studies also show that the effect of minimum wage is not strongest at the lowest part of distribution, indicating that the minimum wage is not effective in helping the bottom part of the wage distribution (Neumark et al, 2004; and Arango and Pachon, 2004). This evidence is likely to be found particularly in developing country cases where the minimum wage compliance is relatively lower than in developed countries.

The second objective is to re-assess the impact of minimum wage policy on Indonesian employment using regional panel data method. The present study specifically focuses on the minimum wage effect on paid employment which is legally covered by the minimum wage policy (as a part of the formal sector employment). In Indonesia, similar to the other developing countries, although all workers or paid employment are legally covered by the minimum wage policy, the compliance is relatively low given the lack of enforcement and the large size of the informal sector (see Suryahadi et al, 2003 for Indonesia; and Gindling and Terrell, 2007 for Costa Rica). The proportion of paid employment in Indonesia is around 39% of the total employment, with about 20% still paid below the minimum wage level.

This chapter contributes to the international literature in two respects. First, compared to developed country studies, there has been very little empirical research on the effect of minimum wage in developing countries. Although there are some minimum wage studies of Latin American developing countries, Indonesian data show a unique characteristic, in that the minimum wage varies across provinces (regions). In comparison, Brazilian and Colombian minimum wages are set at a national level (see Lemos, 2004d and Arango and Pachon, 2004), while Costa Rican and Hondurasian minimum wages are set at an industrial and firm-size level (see Gindling and Terrell, 2006 and 2007). In other words, Indonesia is an ideal study to investigate the effects of changes in the regional minimum wage in the case of developing countries due to the fact that the minimum wage is set provincially rather than nationally, giving more regional variations in the minimum wage. Compared to the other developing countries with a single (national) minimum wage, therefore, the Indonesian case also provides a better source for a panel data study of the effects of minimum wage on wages and employment.

Second, this study compares five different measurements that are commonly used to measure the minimum wage variable in the international literature, including: (a) the log of real minimum wage; (b) toughness; (c) the fraction of workers below the minimum wage level; (d) the fraction of workers at the minimum wage level; (e) the fraction of workers affected by the minimum wage (defined as the proportion of workers which earns a wage between the old minimum wage and the new one). There is no clear justification about which is the most effective type of measurement. The results might be different from one country to another and will depend on each minimum wage regime and also labour market characteristics. The detailed discussion about each measurement is presented in the methodology section. In addition, this research employs several different panel data methods, including the simple fixed effects model, Panel Corrected Standard Error (PCSE), and a Dynamic Arellano-Bond panel data model. The reason for using these different approaches is to obtain the most robust estimates of the effects of minimum wage on wages and employment in Indonesia.

The rest of this chapter is organized as follows. Section 5.2 reviews the previous minimum wage studies using panel data sets. Section 5.3 discusses the methodology used in this study. Section 5.4 explains the main data sources for this research. Section 5.5 analyses the main findings. Finally, section 5.6 provides conclusions.

7.8. Previous Minimum Wage Studies Using Regional Panel Data

This section reviews the previous minimum wage studies using regional (and industrial) panel data methods, while the previous minimum wage studies using individual level panel data (and pooled cross sectional-time series data) sets will be discussed in the next chapter. The previous studies are reviewed separately in the case of developed and developing country studies. In comparison, the minimum wage coverage in developed countries tends to be complete and fully enforced, while in developing countries, there is a tendency towards incomplete coverage, given the lower compliance and the lack of enforcement.

5.2.1. Developed Country Studies

The first influential study on the effects of minimum wage on wages and employment in developed countries using the regional panel data method was the study conducted by Neumark and Wascher (1992). Specifically, they estimated the effects of the minimum wage on teenagers and young adults using the United States the state-level panel data method for the years 1973 to 1989. In this case, the ratio of minimum wage to the average wage in the state level (multiplied by the minimum wage coverage) was employed as the minimum wage measure. Using year and state fixed effects, in general they found that the minimum wage had a negative effect on employment. In order to check the robustness of the result, they also modified their model using the two-stage least squares method (mean of the minimum wage level in the neighbouring states was used as an instrumental variable) and dynamic effects of the first-difference estimates. They concluded that a 10% increase in minimum wage decreased teenage employment by between 1% and 2% and decreased young adult employment by between 1.5% and 2%.

Using a panel data method similar to that used by Neumark and Wascher (1992), Williams (1993) examined more specific regional effects of the minimum wage on teenage employment in the United States for the years 1977 to 1989. Two different minimum wage measures were employed. Those were the ratio of minimum wage to the average wage in the manufacturing sector (relative minimum wage) and the real minimum wage (average wage in the manufacturing sector was included in the analysis as a separate explanatory variable). In order to obtain specific regional effects, the interactions between the minimum wage measures and region dummy variables were also employed in some specifications. Williams (1993) found that, on average, an increase in the minimum wage by 10% reduced teenage employment by 4.8% using real minimum wages and by 3.3% using relative minimum wages. Although the coefficients were relatively higher than Neumark and Wascher's (1992), the results were consistent with the standard competitive model, suggesting a negative relationship between minimum wage and employment.

In the more recent study using the United States data, Burkhauser et al (2000) estimated the effects of the federal minimum wage on teenage wage and employment using monthly panel data for the years 1979 to 1997. Compared to the previous studies, one of the advantages of using the monthly data set is that it increased the number of observations. Using the log of the greater of state or federal minimum wage as the minimum wage measure, they concluded that an increase in minimum wage increased teenage wage rate with the elasticity of between 0.3 and 0.48. Moreover, in measuring the employment effect, they found that minimum wage had a negative effect on teenage employment with the elasticity of between -0.2 and -0.6. However, they pointed out that the minimum wage coefficient was not significant when year dummies were included in the model due to their high correlation with the minimum wage.

Canada is another good 'laboratory' for minimum wage studies in developed countries using regional panel data as the minimum wage is set differently across provinces. Baker et al (1999) examined the effects of Canadian minimum wage on teenage employment using the regional panel data method over the periods 1975 to 1993. In their study, the minimum wage was measured by the ratio of the minimum wage to the average manufacturing wage. They found that, on average, a 10% increase in minimum wage reduced teenage employment by 2.5%. In addition, using a dynamic model, Baker et al (1999) decomposed the minimum wage effects into 'low-frequency' and 'high-frequency' variations. At low-frequency, which captured cycles of six years or longer, the elasticity was negative and significant, suggesting that the negative effect of minimum wage was dominated by the minimum wage changes in the long-run.

McDonald and Myatt (2004) re-estimated the effects of minimum wage on teenage employment in Canada from 1976 to 2002 using a regional panel data set. Using the ratio of minimum wage to the average manufacturing wage as the minimum wage measure, McDonald and Myatt (2004) extended the previous Canadian minimum wage analysis by looking at the stability of the results across time and space. Although the minimum wage effects on employment remained negative and significant, they found that the effects were unstable across time and space. In terms of time period, for example, the minimum wage effects were large and negative during the period 1990-1996, but were not significant during the period 1997-2002 when the minimum wage was not relatively binding. In addition, the result suggests that the minimum wage effects were insignificant in some provinces because of insufficient variation in the minimum wage measure.

Campolieti et al (2006) compared different minimum wage measures, including the ratio of minimum wage to the average wage and the fraction of youth employment paid less than minimum wage level using a Canadian regional panel data set from 1981 to 1997. In order to check the robustness of the result, they also separated the minimum wage and the average wage variables instead of using the ratio as the minimum wage measure. In general, they found that an increase in minimum wage reduced youth employment (aged 16-24) with the elasticities of between -0.17 and -0.44.

In the United Kingdom, Machin and Manning (1994) examined the effects of minimum wage changes on wage dispersion and employment using ten Wage Council industrial data sets. In practice, the industrial Wage Councils in the United Kingdom consisted of employers and workers representatives, as well as some independent members that set the minimum hourly wages for workers in their industries. Catering, retailing, and clothing manufacture were the largest industries in terms of employment covered by the minimum wage. Using toughness (ratio of the minimum wage to the average wage) as the minimum wage measure, Machin and Manning (1994) found that it was negatively associated with the wage dispersion in the Wage Councils industries. In terms of employment, interestingly, using different methods, including static, dynamic and instrumental variable methods, they found that an increase in minimum wage significantly increased employment, suggesting the presence of monopsony.

Dickens et al (1999) supported Machin and Manning's (1994) finding about the presence of monopsony in the United Kingdom labour market. They specifically examined the effects of the minimum wage on wage distribution and employment using more detailed industrial and occupational information in the Wage Council industries panel data sets for the years 1975 to 1992. In terms of wage, specifically, they examined the effects of minimum wage on the hourly wage at each decile in the wage distribution. They found that the effects of the minimum wage were positive and significant only in the lower deciles. The strongest effect was found at the lowest decile of the wage distribution, indicating that there was a tendency for the minimum wage to compress the wage distribution. In terms of employment, using several methods including static and dynamic models, the toughness coefficient was positive. This result implied that there was no evidence of negative impact on employment, again suggesting the presence of monopsony power.

Stewart (2002) estimated the impact of the 1999 minimum wage introduction on employment using geographical or regional variations across 140 areas in the United Kingdom. Besides employing regression of the relationship between the employment rate and the fraction of workers that earn a wage below the minimum wage level, he compared the difference-in-difference estimator in the high and low wage areas. The "high impact" regions are defined as the areas with the highest proportion of the low-paid workers, while in contrast, the "low impact" regions are defined as the areas with the lowest proportion of low-paid workers. As a result, contrary to the standard competitive model, Stewart (2002) concluded that there was no evidence of an adverse employment effect in the "high impact" areas that potentially contain a big proportion of low wage workers.

Using a different methodology and object of study, Machin et al (2003) investigated the impact of the 1999 minimum wage introduction on employment in the residential care home sector. This sector is chosen as the focus of study since it contains more low-wage workers who are most affected by the minimum wage policy introduction. In this case, they employed two different measurements of the minimum wage, including the proportion of workers paid below the minimum wage level (before the minimum wage introduction) and the wage gap. Using reduced-form employment equations, they found that the introduction of minimum wage reduced the employment level and hours of work in the residential care home sector. Although the findings seem to contradict with the previous United Kingdom studies, Machin et al (2003) argued that their result did not provide the complete picture of the impact of minimum wage introduction on the overall labour market, due to their focus on the specific sector in which the minimum wage mostly affects.

Neumark and Wascher (2004) investigated the effects of minimum wage on youth employment using cross-national data of 17 OECD countries for the years 1975 to 2000. In this case, they employed the pooled cross-section time series data set because it was not possible to provide a complete panel data set with the same information from different countries for long time periods. The ratio of minimum wage to the average wage was employed to measure the minimum wage variable. In practice, this measure was useful to reduce the potential bias from the correlation between the minimum wage and the other economic conditions that affect the average wage rate. The result indicated that the effects of the minimum wage on youth employment were negative using different methods and specifications. Specifically, the effects of minimum wage on teenage employment were slightly higher than the effect of minimum wage on young adults employment, particularly when country-specific trends were included in the specification and when using a dynamic model.

In addition, Neumark and Wascher (2004) extended the analysis by adding some specific dummy variables in their specification in order to capture any differences in the minimum wage system and labour market policy in each country. In terms of the minimum wage system, it was indicated that the negative effect was smaller in the country where the minimum wage level was set by collective bargaining. In contrast, the negative effect of minimum wage was larger in the country with regional or industrial variations than in the country with single (national) minimum wage level. In terms of labour market policies, rigid labour standards lead to larger negative effects of minimum wage, while greater employment protections and the usage of the active labour market policies tend to reduce the negative effects of a minimum wage.

5.2.2. Developing Country Studies

The minimum wage studies in developing countries are mostly dominated by the studies conducted in Latin America. One of the earliest developing country studies is the study of the United States minimum wage imposition in Puerto Rico's labour market conducted by Castillo-Freeman and Freeman (1992) using pooled time-series cross-sectional method for the period 1951-1997. The minimum wage in Puerto Rico is operated under the US minimum wage laws due to that Puerto Rico is a semi-autonomous region of the United States[7]. In practice, it was interesting to see this impact due to the fact that the average wage in Puerto Rico was only a half that of in the United States. The ratio of minimum wage to the average wage was also 85% higher in Puerto Rico than in the United States, suggesting a potential large reduction in Puerto Rican employment.

Castillo-Freeman and Freeman (1992) found that the effects of the minimum wage on hourly wages for both total employment and manufacturing employment in Puerto Rico were positive and significant (the coefficients were 0.27 and 0.24 respectively). In terms of employment, they found that the United States minimum wage led to a reduction in Puerto Rican employment with the coefficient of -0.54. Specifically, using separate regressions before and after 1974 (before and after the extension of the US minimum wage to Puerto Rico), they found that the minimum wage reduced employment particularly in the periods after 1974. After the extension of the US minimum wage, the coefficient of the minimum wage was -0.91, while before the extension of the US minimum wage, the coefficient was not significantly different from zero.

[7] Although Puerto Rico is a semi-autonomous region of the United States, the analysis in this section is included in developing country studies because they have similar characteristics to developing countries' labour markets.

Bell (1997) compared the effects of minimum wage on skilled and unskilled employment in Mexico and Colombia using panel data on manufacturing firms. In Mexico, the minimum wage is set differently across 14 regions (although the numbers decreased after 1984), while in Colombia the minimum wage is set differently across large firms, small firms, and agricultural areas. Bell (1997) found that the effects of minimum wages on Mexico and Colombia are different, although they have similar labour market characteristics. In Mexico, she found that the minimum wage had no significant effect on formal sector wages and employment. The reason is because the minimum wage policy was not effective in Mexico as the average wage was relatively much higher than the minimum wage level. In contrast, the minimum wage had a positive and strong impact on the wages in Colombia as the minimum wage policy was more binding than in Mexico. In conclusion, Bell (1997) found that a 10% increase in minimum wage in Colombia reduced low paid unskilled labour by between 2% and 12%.

Contrary to Bell (1997), Feliciano (1998) found different results using Mexican employment data from 1970 to 1990. He extended the Mexican minimum wage analysis by estimating the effects of the minimum wage separately by gender and age groups. Using the ratio of minimum wage to average wage as the minimum wage measure, he found that a reduction in the Mexican minimum wage increased female employment (with the elasticities of 0.58 and 1.25 using OLS and instrumental variable method respectively). However, there was no significant minimum wage effect on male employment, as their average wages were relatively higher than female employment (except for the age group 55-64). Feliciano (1998) argued that his result was relatively different from that of Bell (1997) because they used different dependent variables. In this case, Bell (1997) focused on employment in large manufacturing firms where the average wage was relatively higher than the minimum wage level, while Feliciano (1998) used total employment in the labour market where the minimum wage was more binding.

Arango and Pachon (2004) examined the effects of minimum wages on both family income per capita distribution and individual income distribution using a dynamic panel data set for the seven largest cities in Colombia from 1984 to 2001. Two different measures of minimum wage were employed including the fraction of workers affected by the minimum wage and the ratio of the minimum wage to the average wage. They found evidence that the minimum wage increased the family and individual incomes only at the middle and the upper part of distribution. They concluded that there was no significant effect on the incomes at the bottom part of distribution, suggesting that the minimum wage was not effective to induce a higher standard of living for workers at the lower part of distribution.

In contrast to the other developing country studies above, El-Hamidi and Terrell (2002) found potential monopsony evidence when estimating the effects of minimum wage on employment in Costa Rica using an industrial level panel data set as the minimum wage is set differently across industries and occupation categories. In order to investigate whether the minimum wage effects in Costa Rica were non-linear, a quadratic toughness (ratio of the minimum wage to the average wage) variable was employed as the minimum wage measure. The findings suggested that the minimum wage effect on employment was positive when toughness was low, supporting the monopsony model. However, after toughness reached 68% using total employment data (and 75% using covered sector employment data), the minimum wage reduced employment by between 0.4% and 0.6%, suggesting that the minimum wage effect on employment was non-linear.

A more comprehensive study was conducted by Lemos (2004d and 2005) using panel data from 1982 to 2000 across six metropolitan regions in Brazil. The effects of minimum wage on wages and employment were estimated using five different measurements commonly used in the literature including the log of real minimum wage, toughness, the fraction affected, spike, and the fraction below. Lemos (2005) found that the minimum wage strongly compressed the wage distribution as indicated by stronger effects in the lower percentiles of distribution. Comparing minimum wage measures, she concluded that the fraction affected is the preferred minimum wage measure in estimating the effects of the minimum wage on the wage distribution as the findings were robust and unbiased compared to the other measures. Spike (the fraction at) tended to be endogenously determined with wage, while the log of real minimum wage and toughness are not well-suited measurements for Brazilian data as the minimum wage is set at national level.

Lemos (2004d) decomposed the total employment effect into jobs effect (the employment rate) and hours effect (the hours worked). In the short run, she found that an increase in minimum wage by 10% decreased the employment rate by 0.02% and decreased the hours worked per worker by 0.14%, suggesting a decrease in the total effect (man-hours) by 0.16%. In the long run, the total effect was relatively small with the coefficient of -0.05%. As pointed out by Lemos (2004d), the reason for a small employment effect is because there is a non-compliance problem in Brazil, as well as because the public sector has an inelastic labour demand.

Comparing minimum wage measures in the employment equation, Lemos (2005) found that the relative minimum wage measures, including the log of real minimum wage and toughness (Kaitz Index), were not robust enough in estimating the effects of minimum wage on employment. The main reason is because the minimum wage in Brazil was not set differently across regions (or industries); therefore, the variations of the measures (toughness, for example) came primarily from the variations in the denominator (i.e. did not come from the variations in the minimum wage (the numerator)). The negative and significant employment effects were only found using degree of impact measures, including the fraction below, the fraction at, and the fraction affected. The coefficient of the fraction below was the largest of the other degree of impact measures.

Gindling and Terrell (2007) estimated the impact of the minimum wage on different types of employment in Honduras using industrial and firm size panel data from 1990 to 2004, as the minimum wage in Honduras is set over 11 industries and 2 firm sizes (small and medium/large firm sizes). Using the dynamic Arellano-Bond method, they found that the minimum wage had a negative impact only on medium and large-scale enterprises employment where the minimum wage was effectively enforced with the elasticity of 0.46. On the other hand, the minimum wage had a positive impact on small firm employment with the elasticity of 0.39, suggesting a possible employment shift from the medium and large enterprises to the small enterprises where non-compliance with the minimum wage is more likely to exist.

The pioneering work on estimating the effect of minimum wage on employment in Indonesia was Rama (2001). He focused specifically on the effect of minimum wage on average wage, employment and investment in Indonesia from 1988 to 1995. Using regional panel data method, Rama (2001) found that the elasticity of the average wage with respect to the minimum wage was positive with the coefficient of 0.1. In terms of employment, Rama (2001) estimated the effect of minimum wage on urban employment as the category of employment that is most affected by the minimum wage policy. He used the ratio of employment to population in urban areas as the dependent variable, while the ratio of the minimum wage to some indicators of labour productivity was employed as the minimum wage measure. As a result, the coefficient of the minimum wage variable in the employment equation was negative and significant, although some labour productivity indicators were statistically insignificant. It was suggested that a higher minimum wage reduced urban paid employment in Indonesia, with the elasticities of between -0.025 and -0.014.

The other issue addressed by Rama (2001) was whether the minimum wage affected investment. His findings showed that a positive change in the minimum wage negatively affected total investment, excluding Foreign Direct Investment (FDI). In conclusion, Rama (2001) suggested that doubling the Indonesian minimum wage led to a 10% increase in the average wage, a 2% decrease in paid employment, and a 5% decrease in domestic investment. In addition, as pointed out by Rama (2001), a decrease in employment appeared to be considerable in small firms where the minimum wage was more binding, while in large firms where the average wage was relatively high, employment might actually increase, suggesting that minimum wage was not binding for workers in large firms.

Islam and Nazara (2000) found interesting and different results from Rama (2001) using a pooled cross-sectional time-series data regression at provincial level in Indonesia from 1990 to 1998. In contrast to Rama (2001), they suggested that there was no adverse impact of minimum wage on employment in Indonesia. Although the minimum wage effect on employment was negative using added control variables, they argued that this negative impact was negligible. As suggested by Islam and Nazara (2000), if the Gross Domestic Regional Product (GDRP) can grow at least by 4 percent every year, the minimum wage can still increase by 24 percent without any adverse impact on employment. In other words, with higher regional economic growth that potentially creates more employment, the negative effect of minimum wage on employment might be diminished.

Suryahadi et al (2003) estimated the effects of minimum wage on the Indonesian urban formal labour markets using a fixed effects model. As well as focusing on the effect of minimum wage on total employment, they also focused on specific groups of workers such as females, youths and less educated workers from 1988 to 1999, using data from 26 provinces. They found more specific results showing that the minimum wage gave advantages to some workers and disadvantaged others. Specifically, they found that the white-collar workers clearly benefited from an increase in the minimum wage. It was suggested that an increase in the minimum wage by 10% led to an increase in employment of the white-collar workers by 10%. On the other hand, employment of the most 'vulnerable' workers (i.e., females, youths, and less educated workers) significantly decreased as a result of an increase in minimum wage. Suryahadi et al (2003) argued that employers respond to an increase in the minimum wage by employing more capital-intensive and high-skilled workers than labour-intensive activities with more low-skilled workers. In addition, they also argued that these low-skilled affected workers might be shifted to the informal sector (displacement effect) with lower wages and poorer working conditions. However, there is still no justification about this potential displacement effect in the case of Indonesia.

The latest Indonesian minimum wage study was a case study conducted by Alatas and Cameron (2008) focusing specifically on the extent of compliance of Jakarta's provincial minimum wage on the Botabek area (Jakarta and West Java border) which is administratively under the province of West Java. Unlike the previous Indonesian minimum wage studies which use a regional panel data method, they employed a difference-in-difference method using the household level data from 1990 to 1996 specifically on the clothing, textiles, footwear, and leather industries. They found that the minimum wage increased the average wage more in Botabek area than Jakarta because the minimum wage was originally lower in Botabek (West Java) than Jakarta. Relating to employment, they found that the minimum wage decreased employment in small firms with elasticities of between -0.31 and -0.55. Similar to Rama (2001), they found that there was no evidence of an adverse impact of the minimum wage on employment in large firms where the minimum wage was less binding.

Comparing this chapter to the previous minimum wage studies in Indonesia, firstly, there is a difference in the sample period used as this chapter data is based on the more recent sample period (from 1989 to 2003). Secondly, there is a difference in methodology. Most of the previous Indonesian minimum wage studies used the fixed effects method appropriate for panel data. However, none of them were concerned with the potential bias from the simple fixed effects estimates. As pointed out by Gindling and Terrell (2007), simple fixed effects estimates are potentially biased because of serial correlation across error structure and because of endogenous correlation between minimum wage and wages and/or employment. This issue will be observed further in the empirical results section. As an alternative, three other panel data methods will also be employed, including Panel Corrected Standard Errors (PCSE), instrumental variable and Dynamic Arellano-Bond estimates, which tend to provide more robust estimates.

Although this chapter's methodology is relatively similar to Lemos (2004d and 2005) in Brazil, we might expect to see different results in the case of Indonesia. Firstly, the minimum wage in Brazil is set at a national level, while in Indonesia the minimum wage is set at a provincial (regional) level. Therefore, it might be expected that the Indonesian panel data set will explain the variation across regions better than Brazil. Secondly, Lemos (2004d) assumed the Brazilian minimum wage coverage to be full, while in Indonesia there is a tendency towards incomplete coverage, given a high proportion of workers in the uncovered sector. In addition, paid employment that earns a wage below the minimum wage level is about 20% of total paid employment, creating an uncovered sector as well. Few studies examine the impact of the minimum wage on employment where coverage is incomplete (for an exception, see Jones, 1997).

Table 5.1 summarizes the estimated effects of the minimum wage on wages and employment using regional (and industrial) panel and pooled cross-section time-series data in the literature. In summary, previous minimum wage studies showed that a higher minimum wage led to an increase in the average wage. Relating to the wage distribution, some studies found that the minimum wage effect had the strongest effect in the lower part of wage distribution (see for example, Dickens et al, 1999 and Lemos, 2004d), while the other studies found that there was no evidence of significant effect at the lowest part of the wage distribution particularly when the compliance was low (Arango and Pachon, 2004). In terms of employment, although most of the previous studies showed a negative employment effect supporting the standard competitive model, some previous studies also showed an increase in employment supporting the presence of monopsony (see for example Machin and Manning, 1994 and Dickens et al, 1999 in developed countries and El-Hamidi and Terrell, 2002 in developing countries).

Table 5.1 Summary of Previous Minimum Wage Studies Using Panel Data Method

Panel A: Developed Country Studies

Country/Author	Method	Minimum Wage Measure	Conclusion
United States: Neumark and Wascher (1992)	State-level panel data	Ratio of the minimum wage to the average wage in the state level	a 10% increase in the minimum wage **decreased** the teenage employment by between 1% and 2% and **decreased** the young adult employment by between 1.5% and 2%.
United States: Williams (1993)	State-level panel data	Ratio of minimum wage to the average wage in manufacturing sector (relative minimum wage) and real minimum wage	An increase in the minimum wage by 10% **reduced** the teenage employment by 4.8% using real minimum wage and by 3.3% using relative minimum wage.
United States: Burkhauser et al (2000)	State-level monthly – panel data	Log of the greater of state or federal minimum wage	An increase in the minimum wage **increased** the hourly teenage wage rate with the elasticity of between 0.3 and 0.48. In terms of employment, minimum wage had a **negative effect** to the teenage employment with the elasticity of between -0.2 and -0.6.
Canada: Baker et al (1999)	Provincial panel data	Ratio of minimum wage to the average manufacturing wage	a 10% increase in the minimum wage **reduced** the teenage employment by 2.5%.
Canada: McDonald and Myatt (2004)	Provincial panel data	Ratio of minimum wage to the average manufacturing wage	The minimum wage effects were large and **negative** during 1990-1996 periods, but were **not significant** during 1997-2002 periods when the minimum wage was not relatively binding.
Canada: Campolieti et al (2006)	Provincial panel data	Ratio of minimum wage to the average wage and fraction of youth employment who earn less than minimum wage	An increase in the minimum wage **reduced** youth employment (aged 16-24) with elasticities of between -0.17 and -0.44 across specification.
United Kingdom: Machin and Manning (1994)	Panel data on ten Wage Council's industries	Toughness	An increase in the minimum wage **decreased** the wage dispersion. In terms of employment, an increase in the minimum wage significantly **increased** employment, suggesting the existence of monopsony power.
United Kingdom: Dickens et al (1999)	Industrial Panel Data	Toughness	The effects of minimum wage on the wages were **positive** and significant only at lower deciles. In terms of employment, there was **no evidence of negative impact** on employment, suggesting a potential monopsony.
United Kingdom: Stewart (2002)	Different-in-differences estimate	Individuals in the "high impact" and "low impact" regions	**No evidence** of an adverse employment effect in the "high impact" areas.
United Kingdom: Machin et al (2003)	Reduced-form model regression (using Instrumental Var.)	(1) Proportion of workers paid below the MW level (2) Wage Gap	The introduction of the minimum wage policy **reduces** the employment and hours of work in the residential care home sector.
17 OECD Countries: Neumark and Wascher (2004)	Pooled cross-section time series data	Ratio of minimum wage to average wage was employed to measure the minimum wage	The effects of minimum wage on youth employment were **negative** using different methods. Specifically, the effects of minimum wage on teenage employment are slightly higher than young adults employment.

Panel B: Developing Country Studies

Country/Author	Method	Minimum Wage Measure	Conclusion
Puerto Rico: Castillo-Freeman and Freeman (1992)	Pooled time-series cross-sectional approach across industries	Ratio of minimum wage to the average wage	The effects of minimum wage on average hourly wages were **positive** for both all employment and manufacturing employment (the coefficients were 0.27 and 0.24, respectively). In terms of employment, the ratio of minimum wage to the average wage was **negative** with the coefficient of -0.54.
Mexico & Colombia: Bell (1997)	Panel data on manufacturing firms	Ratio of minimum wage to the output price deflator	The minimum wage had **no significant effect** on formal sector wages and employment in Mexico. A 10% increase in the minimum wage in Colombia **reduced** low paid unskilled labour by between 2% and 12%.
Mexico: Feliciano (1998)	Panel data on manufacturing firms	Ratio of minimum wage to the average wage	A reduction in the Mexican minimum wage **increased** female employment (the elasticity is 0.58 using OLS and 1.25 using instrumental variable method).
Colombia: Arango and Pachon (2004)	Dynamic panel data for 7 largest cities	Fraction of affected by the minimum wage and the ratio of minimum wage to the average wage.	The minimum wage **increased** the family and individual incomes only at the middle and the upper part of distribution.
Costa Rica: El-Hamidi and Terrell (2002)	Industry level panel data	Toughness	The minimum wage was **positive** when the toughness was low, supporting a potential monopsony evidence.
Brazil: Lemos (2004d)	Panel data across regions	log of real minimum wage, toughness, fraction affected, spike, and fraction below	The minimum wage strongly compressed the wage distribution. In terms of employment, an increase in the minimum wage by 10% **decreased** the employment rate by 0.02% and the hours worked per workers by 0.14%, suggesting a **decrease** in the total effect by 0.16%. In the long run, the effects was less than -0.05%.
Honduras: Gindling and Terrell (2007)	Industrial and firm size panel data	log of real hourly minimum wage and the fraction at	The minimum wage had a **negative** impact on medium and large-scale employment with the elasticity of 0.46. In contrast, the minimum wage had a **positive** impact on small firm employment with the elasticity of 0.39.
Indonesia: Rama (2001)	Regional Panel Data	Ratio of the minimum wage to some indicators of labour productivity	The elasticity of the average wage with respect to the minimum wage was 0.1 and **positive.** A higher minimum wage **reduced** urban paid employment in Indonesia. The average elasticity is in the range between -0.025 and -0.014.
Indonesia: Islam and Nazara (2000)	Pooled data regression at provincial level	Log of real minimum wage	The result showed a **positive** relationship between the minimum wage and employment. However, if the Gross Domestic Regional Product (GDRP) and dummy variables of region and time are used as control variables, the result will be **negative.**
Indonesia: Suryahadi et al (2003)	Regional panel data	Log of real minimum wage	An increase in the minimum wage by 10% led to an **increase** of 10% of employment of the white-collar workers. There was **no evidence** that the minimum wage may increase the average wage across all types of employment, except for the blue-collar workers.

7.8. Research Methodology

This section outlines the research methodology used in this chapter to examine the effects of changes in the minimum wage on wages and employment in Indonesia. In general, similar to Rama (2001) and Suryahadi et al (2003), this chapter uses the aggregate provincial panel data set from 1989 to 2003 for 26 provinces in Indonesia, providing a balanced panel data set. Relating to the first objective, this chapter specifically estimates the effect of the minimum wage on wages. This is important because the minimum wage is predicted to affect employment only if they first show the significant impact on the wage rates (Burkhauser et al, 2000). Therefore, this wage effect of minimum wage can be viewed as a necessary condition for the employment effect of minimum wage. Specifically, the wage equation used in this chapter is as follows:

Wage equation:

$$lnW_{it} = \alpha_0 + \alpha_1\, ln\, MW_{it} + \psi X_{it} + \chi\, UR_{it} + \gamma_i + v_t + \varepsilon_{it} \qquad (5.1)$$

The dependent variable in this equation (*W*) is the log of the average monthly wages of paid employment in province *i* and year *t*. Paid employment is the focus of study as this category of employment is legally covered by the minimum wage policy in Indonesia[8]. The monthly wages are used rather than hourly wages in order to make it comparable with the minimum wage variable which is set based on monthly terms

[8] Although in practice, some of them are still paid below minimum wage level, given the lack of enforcement and ineffective labour unions.

(not hourly terms)[9]. In addition, the Indonesian Labour Force Survey also reports the wage data in monthly terms, although it is possible to obtain the hourly wage data by dividing the monthly wage data into the total hours worked per month. In order to see the full effects of the minimum wage on the wages across the distribution, this equation is not only estimated on the log of the average monthly wage (as a dependent variable) but also the log of the average monthly wage at the percentile (decile) points in the wage distribution. If the minimum wage is binding, we might expect that the minimum wage effect will be larger in the lower percentile points of the distribution.

The main explanatory variable is the minimum wage (*MW*) that applies to each paid employment in province *i* and year *t* based on their residence location. In this case, there is no information in our data set about paid employment based on their workplace location. In other words, this study cannot provide information about how many workers live in a different region to which they actually work in order to assess potential inter-regional spillover effects. However, we argue that this is less likely due to the fact that transportation infrastructure inter-provinces outside Java is relatively weak, while the minimum wage levels in Java (the mainland) are relatively similar across provinces.

Moreover, as noted above, five different measurements that are commonly used in the literature will be compared to measure the minimum wage variable used in this study. Further detail about the minimum wage measurements used in this study will be discussed below.

[9] The minimum wage level in Indonesia is set based on the monthly terms, particularly for full-time workers with a standard 40 hours worked per week, while for part-time workers, the minimum wage level is adjusted on a pro-rata basis

The choices of the control variables are generally motivated by Lemos (2004d and 2005). The vector UR_{it} contains the demand side shifter, which is the unemployment rate. The unemployment rate is used as a proxy of the business cycle to measure labour demand variations. Similarly to Lemos (2004d), the unemployment rate is applied with a one year lag in order to consider the lagged response of the unemployment rate in wages and to reduce the potential simultaneity bias with the average wage.

In addition, vector X_{it} contains the supply side shifters to capture the labour supply characteristics, including the proportions of the labour force who are youth, women, living in urban areas, have high school and university qualifications (high level education), and the proportions of the work force in the manufacturing industry, trade, construction and services sectors. In practice, the effects of the minimum wage on wages and employment have been typically analyzed as the labour demand equation. However, using the exogenous supply side shifters as control variables is necessary to explain the effect from the supply side as well as the demand side, indicating a reduced form equation from a simple interaction between labour supply and labour demand (Brown et al 1982). Moreover, Brown et al (1982) argued that the supply side shifter might be excluded if we focus specifically on workers paid at the minimum wage level. In practice, the effect of the minimum wage on overall paid employment is estimated in this study; including workers paid above the minimum wage level which is determined by an interaction between the demand and supply of labour, hence the inclusion of supply side shifters in the equation is needed and does not bias the estimation.

The variables γ_i and v_t are included to control for provinces and yearly fixed effects respectively. The inclusion of the provinces dummy variables reduces the potential bias from unmeasured provinces-specific demand shocks. In addition, yearly dummy variables are useful to control for year-specific characteristics and to control for the potential endogenous changes in the yearly minimum wage.

In practice, the minimum wage is potentially endogenous if it is affected by the regional labour market conditions. However, Rama (2001) pointed out that there is no evidence of endogeneity in the mechanism to set the Indonesian minimum wage. As pointed out by Rama (2001), the index of minimum living needs (KHM), as the main consideration to set the Indonesian minimum wage, is not directly affected by the labour market conditions suggesting that an increase in minimum wage is mainly exogenous. In contrast, specifically, Suryahadi et al (2001) argued that the minimum wage might be simultaneously determined with wage rates because the existing wage rates were usually also used as the consideration for regional government to set their minimum wage level, while relating to employment, the minimum wage tended to be exogenous. In order to check the potential endogeneity of the minimum wage measures used in this study, the Davidson-MacKinnon test of endogeneity for a panel data regression will be provided. This test will also be useful to decide which minimum wage measure is the most effective in the case of Indonesia.

Relating to the second objective, this chapter estimates the effects of changes in the minimum wage on employment using the aggregate provincial panel data set. As noted above, this effect is focused on paid employment which is legally covered by the minimum wage policy. Specifically, the reduced form employment equation is as follow:

Employment Equation:

$$lnEmp_{it} = \alpha_0 + \alpha_1 \ln MW_{it} + \psi_{it} X + \gamma_i + v_t + \varepsilon_{it} \qquad (5.2)$$

where *Emp* is number of total paid employees that are employed in province *i* and year *t*[10]. As indicated in the wage equation, paid employees are aggregated based on their residence location because of data unavailability on worker's workplace location (region). In this chapter, I focus on total (aggregate) paid employees providing a basic analysis on the impact of minimum wage on employment in the covered sector in Indonesia, while in the next chapter the impact of minimum wage will be extended for workers in both the covered and uncovered sectors, presenting a complete analysis in the labour market. According to the standard competitive model, an increase in the minimum wage is generally predicted to reduce total paid employment as the category of employment legally covered by the minimum wage policy. In this case, the affected paid employment tends to be displaced to the uncovered sector employment rather than become unemployed in the absence of unemployment benefits. Compared to paid employment category, the uncovered sector employment usually does not benefit from permanent job security, health insurance, and old-age pensions. Therefore, we argue that it is also a bad thing if the minimum wage reduces paid employment and increases uncovered sector employment which will be explored in the next chapter. Moreover, the minimum wage measures and the other explanatory

[10] As suggested by Brown et al (1982), total employment is used as a dependent variable rather than employment rate if we believe that the minimum wage is mainly demand determined, while the supply side shifters are included as the control variables.

variables used in this equation tend to follow the wage equation, except that the unemployment rate is excluded from the equation in order to reduce potential spurious correlation with employment in the left-hand-side of the equation.

Following the ideas of Lemos (2004d and 2005), this chapter presents the comparison of five different measurements which are commonly used in the literature to measure the minimum wage, including: (a) the log of real minimum wage; (b) toughness; (c) the fraction below; (d) the fraction at; (e) the fraction affected[11]. These five measures are employed in both wage and employment equations, except toughness, which is only used in the employment equation[12]. The main reason for using different measurements is to compare the results from the different common measures of the minimum wage in the literature. In practice, there is no clear justification of which minimum wage measure is the most effective in the literature, depending on the methods and the object of study. In addition, the finding will be stronger when it shows a similar direction across different measurements.

The first measure used to examine the effects of minimum wage on wages and employment is the log of real monthly minimum wage. The real minimum wage is simply the nominal minimum wage adjusted according to the price index. As pointed out by Lemos (2004d), one of the limitations of this type of measure in her context is that it does not identify the relative level of the minimum wage on earnings (compared

[11] In order to include part-time workers (workers who work less than 40 hours per week and who are also legally covered by the minimum wage policy), particularly in the fraction below, the fraction at, and the fraction affected measures, the monthly minimum wage is converted to the hourly minimum wage due to the fact that the minimum wage for part-time workers is set on a pro-rata basis depending on how many hours they worked.

[12] Toughness is not applicable for the wage equation due to the correlation between the denominator and the left-hand-side of the estimator, providing a spurious correlation between toughness and the average wage. See Burkhauser et al (2000) for a complete discussion.

to toughness, for example). In addition, Dolado et al (1996) argued that real minimum wage is not suitable to compare the minimum wage level of regions or industries with different levels of productivity, although it might be controlled by using regions and industries fixed effects.

In practice, the log of real minimum wage variation in the case of Brazil is mostly caused by the variations in the regional deflator as the minimum wage is constant across regions (Lemos, 2005). This evidence implies that the log of real minimum wage is not an effective measure in the case of Brazil as the variations do not arise primarily from the minimum wage. In contrast to Lemos (2005), the log of real minimum wage is expected to provide a better suited measurement in the case of Indonesia as the minimum wage is set differently across provinces; hence, the log of real minimum wage variations is primarily driven by the variation in the minimum wage itself. Besides Lemos (2005), there are a number of studies that used the log of real minimum wage as the minimum wage measure in the literature, including Burkhauser et al (2000) for the US, Gindling and Terrell (2006) for Costa Rica, and Suryahadi et al (2003) for Indonesia.

The second measure of the minimum wage used in this chapter is toughness. Toughness (or Kaitz Index) is basically the ratio of the minimum wage to the average wage, and is given this intuitive name by Machin and Manning (1994). As pointed out by Machin and Manning (1994), toughness is useful to measure the level of the minimum wage and how consistent the minimum is kept at its level. A high rate of toughness indicates that the minimum wage is binding for workers, while a low rate of toughness indicates that workers are less affected by the minimum wage policy.

However, toughness may be less relevant than a variable defined as the ratio of the minimum wage to the wage at the bottom of distribution since those people at the bottom end of distribution is supposed to benefit by the minimum wage policy.

In practice, toughness is not suitable for the wage equation because the wage rate employed as a denominator in the toughness variable is potentially correlated with the wage rate in the left-hand-side of the equation, providing a spurious correlation between toughness and the wage rate (Card et al, 1994). Therefore, this study only uses toughness in the employment equation in order to avoid potentially biased estimates. In Brazil, similarly to the log of real minimum wage, the toughness variation primarily caused by the variation in the average wage as denominator (not that which comes from the variation in the minimum wage) as the minimum wage is set at a national level, suggesting an ineffective minimum wage measure (Lemos, 2004d).

The third measure of the minimum wage is the fraction affected. The fraction affected variable was developed by Card (1992a and 1992b) to measure the proportion of workers which earns a wage between the old and new level of minimum wage. In practice, this measure was effective in measuring the impact of the minimum wage policy in developed countries, particularly using the natural experiment approach (see Card, 1992a and 1992b). As pointed out by Brown (1999), this measure is cleaner than toughness because the fraction affected focuses on the workers affected by the minimum wage, while toughness is determined by variables other than minimum wage (i.e. the wage rates). There is some evidence in developing countries which use the fraction affected as the minimum wage measure, such as Arango and Pachon

(2004) for Colombia and Lemos (2005) for Brazil. It is important to note that this measure will not be effective when the nominal minimum wage is constant over time as there are no workers affected by the minimum wage implying that the fraction affected will be zero (Brown, 1999 and Lemos, 2005)[13]. However, we might expect that this measure is effective in the Indonesian case as the nominal minimum wage tends to increase over time depending on the costs of minimum living needs (KHM). Specifically, all of the equations that use this measure will be changed to the first-difference model in order to capture the proportion of paid employment affected by the differences between the old and new levels of the minimum wage.

In addition, this chapter also employs the "fraction below" and the "fraction at" measures, developed by Dolado et al (1996). The fraction at is the proportion of workers which earn a wage at or near the minimum wage level, while the fraction below is the proportion of workers which earn a wage below the minimum wage level[14]. Both of them also measure how binding the minimum wage is when it is increasing. As pointed out by Lemos (2004d), the "fraction at" also measures the effectiveness of an increase in the minimum wage. Lemos (2004d) argued that the "fraction at" is a well-suited minimum wage measure for the Brazilian case because it is directly affected by the minimum wage. However, this measure potentially underestimates the degree of impact of the minimum wage in Indonesia because based on the regulation the minimum wage level can only be applied to workers who work

[13] Although it is possible that the real minimum wage varies over time, the fraction affected value obtained from the difference between the old and new real minimum wage is not appropriate because the variation in the fraction affected is not only driven by the variation in the minimum wage but also by the variation in the price index (the denominator used to transform the minimum wage in the real terms).

[14] In addition, in order to capture any measurement error, similar to Lemos (2004d), the fraction at and fraction below is calculated using a 5% rounding approximation.

for less than one year[15]. As pointed out by Manning (2003a), the minimum wage in Indonesia seems not to exactly act as the wage floor, but it is more likely to be an instrument for raising the workers standard of living. Not surprisingly, the fraction at in Indonesia is only around 4% of total paid employment, while in Brazil it is 12% of total employment.

On the other hand, the "fraction below" measures the degree of non-compliance with the minimum wage. Although the minimum wage policy legally covers all of the paid employment in Indonesia without exception, some workers remain paid below the minimum level, particularly in rural areas and small enterprises where labour unions are not effective. This condition is also combined with the lack of enforcement capabilities by the government and ineffective sanctions for those employers who do not comply with the policy. A higher minimum wage level might indicate an increase in the proportion of workers paid below the minimum wage level because workers who experience a job loss after the minimum wage increases are likely to accept wages below the minimum wage level rather than become unemployed in the absence of unemployment benefits. On average, the fraction below in Indonesia is 22% of total paid employment.

[15] If the duration of work is more than one year, employers should pay the salary of their minimum wage workers more than the minimum wage level, although it is not clear by how much.

5.4. Data Sources

The main source of the aggregate data used in this study is the Indonesian Labour Force Survey (Sakernas). It is a regular labour force survey in Indonesia conducted by the National Central Bureau of Statistics (BPS) annually and/or quarterly since 1986, except in 1995 when BPS conducted the Intercensal Demographic Survey (SUPAS)[16]. In practice, SUPAS 1995 covered the same questions as Sakernas in the labour force section with a sample which was three times bigger than the common Sakernas. The main objective of Sakernas is to estimate and monitor the labour force statistics and characteristics in Indonesia. This survey provides a rich source of the cross-sectional labour force data, covering about 160,000 respondents (about 0.1% of population) each year. Relating to the objective of this study, the individual data used in this study is aggregated at provincial level.

As pointed out by Smith et al (2002), compared to the other countries' labour force surveys, there are two main limitations of the Sakernas. Firstly, this survey is a cross-sectional labour force survey. Therefore, there is no information about the longitudinal change in the labour force across individuals. As a result, respondents might be different across years. Secondly, relating to the earnings data, this survey does not cover the self-employed (informal sector) earnings before 2002. The only earnings data available before 2002 are for respondents with paid employment status.

However, in accordance with this chapter's objective, this survey is powerful enough to capture most of the changes in the labour force characteristics across provinces. As noted above, this chapter uses survey data from 1989 to 2003 across 26 provinces in

---

[16] Sakernas has been conducted annually since 1994, while it was quarterly before 1994.

Indonesia. The reason for using data from 1989 is the fact that the minimum wage began as an important policy in the Indonesian labour market in the late 1980s. Following a similar format to Suryahadi et al (2003), the panel data set is only constructed for 26 provinces in Indonesia. To simplify, this panel data set does not cover some new provinces that have been formed in 2001 during the decentralization era. In practice, there have been 33 provinces in Indonesia since 2001, including seven newly formed provinces being added to the former ones. In this case, data from the newly formed provinces are combined with those of their original provinces. In addition, East Timor data is excluded because of its independence from Indonesia in 1999.

Based on Sakernas, the employment status is divided into five different categories, including (a) self-employed; (b) self-employed and assisted by non-permanent employees; (c) employer and assisted by permanent employees; (d) workers or paid employment; (e) family or unpaid workers. Although the self-employed is the largest group of employment which contributes to the informal sector, this study specifically focuses on the workers or paid employment category as the sector of employment legally covered by the minimum wage. The effects of the minimum wage on the other employment categories, including employment in the uncovered sector, will be specifically discussed in the next chapter.

The other crucial data used in this chapter are obtained from different sources. The provincial level minimum wage data are obtained from the Department of Manpower and the BPS publications[17]. The provincial consumer price index data which are used to transform the minimum wage and the average wage variable in real terms are obtained from the BPS publication.

Table 5.2 Descriptive Statistics (Panel Data 1989-2003)

Variables	Mean	Std. Deviation	Minimum	Maximum
Log of number of paid employment	13.03	1.15	11.04	15.96
Log of the average monthly wage	11.69	0.30	10.87	12.55
Log of real minimum wage	10.88	0.36	9.80	11.71
Toughness	0.46	0.12	0.08	0.85
Fraction affected	0.12	0.07	0	0.40
Fraction at	0.04	0.02	0.003	0.11
Fraction below	0.22	0.10	0.02	0.53
Urban Areas	0.30	0.18	0.07	1
Youths	0.23	0.03	0.13	0.28
Women	0.39	0.05	0.25	0.49
Industry	0.08	0.05	0.01	0.23
Trade	0.15	0.06	0.03	0.37
Services	0.13	0.04	0.06	0.37
Construction	0.03	0.02	0.01	0.09
High School	0.17	0.07	0.06	0.46
University	0.04	0.02	0.01	0.15
Unemployment Rate (-1)	0.05	0.03	0.01	0.18

Source: Calculated from Sakernas and BPS publication

Table 5.2 provides the descriptive statistics of variables used in this study across years and provinces during the sample period. In comparison, the ratio of minimum wage to average wage (toughness) in Indonesia is relatively higher than Brazil (see Lemos, 2004d), suggesting that the minimum wage is more binding in Indonesia than in Brazil. Toughness is approximately 46% for Indonesia, while for Brazil it is between 27% and 45%. The fraction affected is 12% for Indonesia, while the fraction affected for Brazil is 8%. On the other hand, the fraction at is only 4% for Indonesia, while for Brazil it is 12%.

[17] Local district and city (lower level region) minimum wages that exist in four provinces in Java and Bali, particularly after decentralization era in 2001, are not used in this chapter in order to make it comparable with the other provinces.

The proportion of urban labour force is approximately 30% of total labour force in Indonesia, indicating that the highest proportion of labour force is located in rural areas. The proportion of females in the labour force accounts for approximately 40% of total labour force. Although the proportion is relatively high compared to the other developing countries, the female labour force is most likely represented in the less productive sectors and low wage occupations compared to male workers (Manning, 2003a).

Looking at the sector of activities, the proportions of the workforce in the manufacturing industry, trade, construction and services sectors are less than 20% of total workforce. In other words, the agriculture sector is still the most dominant sector, accounting for more than 40% of total workforce, although the proportion has dropped significantly in the recent period. Relating to educational attainment, only a small proportion of the total labour force has high school or university (tertiary) qualifications, indicating a high proportion of less educated labour in Indonesia. Finally, over the sample period, the unemployment rate is relatively small (about 5%) relating to the absence of the unemployment benefits.

5.5. Empirical Results

5.5.1 The Effect of Minimum Wage on Average Wage

Based on the standard prediction, an increase in minimum wage is expected to increase the average wage if the minimum wage is effectively enforced within the covered sector. The effect of the minimum wage on wages is also a necessary condition before examining the employment effect of the minimum wage. We might expect that the minimum wage will affect employment significantly if it has a significant effect on the wage. As mentioned in the methodology section, the effects of changes in minimum wage on average wage will be estimated using four different measures of minimum wage, including (a) the log of real minimum wage; (b) the fraction affected; (c) the fraction below; and (d) the fraction at[18]. Extending Lemos (2004d and 2005), four alternative panel data regression techniques will also be employed, including the simple fixed effects, Panel-Corrected Standard Errors (PCSE), instrumental variable, and Dynamic Arellano-Bond methods.

5.5.1.1 The Simple Fixed Effects

Firstly, the effect of changes in minimum wage on average wage is estimated using the simple fixed effects method. Table 5.3 presents a set of simple fixed effects method results using four different measures of minimum wage. As presented in the first column, the coefficient of log of real minimum wage is estimated to be positive and significant at 1% level. Using the log of real minimum wage, it is suggested that a 10% increase in the real minimum wage raises the real average monthly wage by 1.66%. The estimated coefficient is relatively higher than Rama's (2001) which use the same measure in the previous Indonesian minimum wage study. In comparison, Rama (2001) found that an increase in the minimum wage by 10% increased the average wage by 1%.

Compared to Rama (2001), firstly, there is a difference in the sample period as this study uses a more recent panel data set. Secondly, relating to the control variables, Rama (2001) used urban population and the Gross Domestic Product as the control variables, while some more specific demand and supply shifters are employed in this

[18] Toughness is excluded in the wage equation as a result of the potential correlation with the wage rate in the left-hand side-estimator (see Burkhauser et al, 2000).

study. Thirdly, Rama (2001) focused on the effects of minimum wage on average wage of full-time workers in urban areas and in the manufacturing sector, while the effects of the minimum wage on the average wage of total paid employment is discussed in this study, including the average wage of part-time workers that are also legally covered by the minimum wage policy.

In the second column, the minimum wage is measured by the fraction affected which comprises the proportion of workers that earn a wage between the old and new level of minimum wage. Similar to the log of real minimum wage, the fraction affected coefficient is positive and significant. In comparison, the coefficient of the fraction affected is relatively higher than the log of real minimum wage with the coefficient of 0.293. However, as pointed out by Lemos (2005), the coefficient of the fraction affected is not directly comparable to the log of real minimum wage coefficient because they measure the minimum wage effect in a different way. In practice, the log of the real minimum wage measures the level of the minimum wage, while the fraction affected measures the proportion of workers affected by the minimum wage. To make it comparable with the log of real minimum wage coefficient, as pointed out by Lemos (2005), the fraction affected coefficient needs to be multiplied with the elasticity of the fraction affected with respect to the log of real minimum wage[19]. The result shows that an increase in minimum wage by 10% raises the fraction affected by 3.73%, suggesting an increase in average wage by 1.09%. In other words, the result indicates that the "comparable" or adjusted coefficient of the fraction affected (0.109) is slightly lower than the log of real minimum wage coefficient (0.166).

[19] Specifically, the fraction affected elasticity is obtained by estimating the fraction affected variable on the log of real minimum wage and all of the control variables.

In the next two columns, the minimum wage is measured by the fraction at and the fraction below, which also measures the degree of impact of the minimum wage. Unlike the previous measures, the fraction at and the fraction below estimates show inconsistent results with what we would expect, suggesting negative effects of the minimum wage on the average wage. This contrary result can be explained by writing that a rightward shift of the earnings distribution automatically raises the average wage and reduces the fraction at and the fraction below measures, suggesting a potential endogeneity bias.

In addition, as noted above, these minimum wage measures might not be effective for the Indonesian case for a number of reasons. Firstly, the fraction at is potentially underestimated to measure the degree of impact of minimum wage in Indonesia because the minimum wage can only be applied to the workers who work for less than one year[20]. It seems that the Indonesian minimum wage tends to be an instrument for raising the standard of living of workers rather than exactly as a wage floor (Manning, 2003a). Secondly, Lemos (2004d) also pointed out that the fraction at is potentially endogenously determined with the labour market condition because the wage bargaining will decide which workers are paid at (or around) the minimum wage level, suggesting a potential endogeneity biased estimate. Specifically, as pointed out by Lemos (2004d), the fraction at will increase when the minimum wage increases and then will decrease when workers who are previously not paid below the minimum wage level bargain to increase their wages above the minimum wage level. Further details about the endogeneity problem will be discussed in the next section. On the other hand, the fraction below measure potentially includes workers (paid

[20] Based on government regulation, minimum wage workers with one year duration of work must be paid above the minimum wage level, although it is not clear by how much.

employment) not truly affected by the minimum wage because of a large non-compliance problem and the greater proportion of workers in the uncovered sector in Indonesia, suggesting a non-effective minimum wage measure for Indonesia.

Table 5.3 Wage Equation using the Simple Fixed Effects Estimate

	Log of Real Minimum Wage		Fraction Affected		Fraction At		Fraction Below	
	(1)		(2)		(3)		(4)	
	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value
MW measure	0.1656	0.000	0.2935	0.021	-0.9075	0.019	-0.1599	0.087
Urban	0.7044	0.000	0.3446	0.021	0.6432	0.000	0.6422	0.000
Youth	-0.2460	0.542	-0.4899	0.263	-0.4243	0.298	-0.4845	0.239
Women	0.4043	0.294	-0.4727	0.319	0.3434	0.381	0.4427	0.261
Industry	-0.9629	0.015	-0.6700	0.124	-0.8183	0.042	-0.8556	0.034
Trade	-1.4901	0.000	-0.8123	0.056	-1.3792	0.000	-1.3426	0.001
Services	-0.1874	0.606	-0.2056	0.632	-0.2392	0.517	-0.1591	0.667
Construction	0.5543	0.511	-0.6238	0.484	0.6990	0.414	0.7852	0.362
High School	-0.0818	0.773	0.4359	0.126	-0.1790	0.534	-0.1655	0.567
University	1.0618	0.175	3.4082	0.000	1.3898	0.081	1.2771	0.109
Unemp Rate (-1)	-0.8432	0.057	-0.6435	0.218	-0.9136	0.042	-0.9514	0.035
Year 1990	0.0800	0.006			0.0939	0.002	0.1023	0.001
Year 1991	0.0629	0.060	-0.0823	0.034	0.1323	0.000	0.1403	0.000
Year 1992	0.0977	0.004	-0.0392	0.303	0.1770	0.000	0.1833	0.000
Year 1993	0.1950	0.000	0.0077	0.841	0.2915	0.000	0.3003	0.000
Year 1994	0.1925	0.000	-0.0859	0.029	0.3230	0.000	0.3414	0.000
Year 1995	0.2293	0.000	-0.0137	0.779	0.3754	0.000	0.3944	0.000
Year 1996	0.2731	0.000	-0.0821	0.093	0.4225	0.000	0.4389	0.000
Year 1997	0.3373	0.000	-0.0295	0.450	0.4920	0.000	0.5039	0.000
Year 1998	0.1428	0.002	-0.3399	0.000	0.2452	0.000	0.2540	0.000
Year 1999	0.2154	0.000	-0.0402	0.304	0.3069	0.000	0.3148	0.000
Year 2000	0.3451	0.000	0.0629	0.090	0.4613	0.000	0.4730	0.000
Year 2001	0.4775	0.000	0.0428	0.295	0.6249	0.000	0.6325	0.000
Year 2002	0.4597	0.000	-0.1030	0.007	0.6254	0.000	0.6374	0.000
Year 2003	0.4785	0.000	-0.0642	0.083	0.6628	0.000	0.6674	0.000
Constant	9.6720	0.000	0.0542	0.072	11.4655	0.000	11.4153	0.000
Observations	390		364		390		390	
Number of Areas	26		26		26		26	
Within group R-sq	0.826		0.442		0.821		0.820	
Diagnostic Tests:								
Test of heteroscedasticity	506.91 (0.00)		955.47 (0.00)		647.23 (0.00)		500.74 (0.00)	
Test of serial correlation	1.16 (0.29)		2.32 (0.14)		1.87 (0.18)		3.07 (0.09)	

Note: Dependent variables are measured as the log of real monthly average wage.
Wald test is used for group-wise heteroscedasticity with the null hypothesis of homoscedasticity.
Wooldridge test is used for first-order autocorrelation test with the null hypothesis of no first order autocorrelation.

In order to check the robustness of these results, the diagnostic tests for serial correlation and heteroscedasticity are undertaken for the simple fixed effects estimates. The Wooldridge serial correlation test provides information about evidence of serial correlation in the error term over time within provinces. If the null hypothesis is rejected, it would imply that there is evidence of serial correlation in the estimation. Moreover, a Wald test of heteroscedasticity is also undertaken to examine whether the panel residuals change over time. The simple fixed effects model assumes the estimation to be homoscedastic in the regression residuals across provinces and years. Ignoring both of these issues would make our estimates inefficient. The estimated standard errors of the regression coefficient would also be biased and inconsistent.

The diagnostic test results for serial correlation and heteroscedasticity are presented in the lower part of table 5.3. The p-values for the Wooldridge test are significant at 5% level suggesting that there is no evidence of serial correlation using the simple fixed estimate. However, according to Wald test results, all of the minimum wage measures suffer from heteroscedasticity. Ignoring this issue will make our estimates inefficient. Therefore, we argue that the results of the simple fixed effect estimates are not robust enough in examining the effect of minimum wage on the average wage in Indonesia.

5.5.1.2 Panel Corrected Standard Errors (PCSE)

In order to deal with heteroscedasticity and/or serial correlation issues, as the second alternative, the wage equation is estimated using the Panel Corrected Standard Errors (PCSE) estimate. In practice, the PCSE, which is recommended by Beck and Katz (1995), allows for the presence of the first-order autocorrelation AR(1) parameter within the panel. The standard model of PCSE also allows the presence of heteroscedastic disturbances and shows a consistent estimate. Compared to the simple fixed effects model, PCSE is therefore relatively corrected from the presence of serial correlation and heteroscedasticity.

Table 5.4 Wage Equation using Panel Corrected Standard Errors (PCSE) Estimate

	Log of Real Minimum Wage		Fraction Affected		Fraction At		Fraction Below	
	(1)		(2)		(3)		(4)	
	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value
MW Measure	0.1669	0.000	0.2881	0.009	-0.8040	0.042	-0.1766	0.098
Urban	0.6289	0.000	0.2699	0.020	0.5900	0.000	0.5682	0.000
Youth	-0.2656	0.477	-0.3703	0.329	-0.3965	0.292	-0.4710	0.209
Women	0.2699	0.446	-0.0880	0.849	0.2359	0.501	0.3085	0.386
Industry	-0.8475	0.015	-0.8778	0.038	-0.7214	0.050	-0.7194	0.051
Trade	-1.4159	0.000	-0.5848	0.124	-1.3359	0.000	-1.2702	0.000
Services	-0.1850	0.627	-0.0783	0.857	-0.2019	0.583	-0.1288	0.726
Construction	0.2269	0.771	-0.2186	0.777	0.3992	0.615	0.3933	0.625
High School	0.0366	0.902	0.3448	0.152	-0.0713	0.817	-0.0489	0.875
University	1.4424	0.049	3.1051	0.001	1.6471	0.021	1.6320	0.021
Unemp Rate (-1)	-0.7675	0.063	-0.4424	0.363	-0.8596	0.027	-0.8808	0.028
Year 1990	0.0765	0.000	0.1131	0.000	0.0914	0.000	0.0995	0.000
Year 1991	0.0591	0.006	0.0230	0.000	0.1284	0.000	0.1389	0.000
Year 1992	0.0942	0.000	0.0609	0.000	0.1735	0.000	0.1825	0.000
Year 1993	0.1888	0.000	0.1097	0.000	0.2858	0.000	0.2976	0.000
Year 1994	0.1836	0.000	0.0153	0.067	0.3150	0.000	0.3371	0.000
Year 1995	0.2251	0.000	0.0746	0.007	0.3714	0.000	0.3952	0.000
Year 1996	0.2586	0.000	0.0287	0.391	0.4109	0.000	0.4297	0.000
Year 1997	0.3208	0.000	0.0719	0.000	0.4784	0.000	0.4928	0.000
Year 1998	0.1260	0.001	-0.2332	0.000	0.2318	0.000	0.2417	0.000
Year 1999	0.1949	0.000	0.0577	0.000	0.2903	0.000	0.2979	0.000
Year 2000	0.3251	0.000	0.1686	0.000	0.4470	0.000	0.4581	0.000
Year 2001	0.4557	0.000	0.1555	0.000	0.6089	0.000	0.6162	0.000
Year 2002	0.4370	0.000			0.6089	0.000	0.6211	0.000
Year 2003	0.4553	0.000	0.0446	0.000	0.6451	0.000	0.6510	0.000
Constant	9.7655	0.000	-0.0515	0.028	11.5656	0.000	11.5198	0.000
Observations	390		364		390		390	
Number of Areas	26		26		26		26	
R-sq	0.954		0.521		0.940		0.952	

Note: Dependent variables are measured as the natural logs of the real monthly average wage. All regressions include province dummies and are estimated assuming a AR(1) error structure.

Table 5.4 provides a set of results using the PCSE estimate. Most of the control variables are significant with the expected signs. The proportion of labour force in urban areas shows a significantly positive effect on the average wage in different regressions. This positive effect is potentially stimulated by a higher economic growth rate in urban areas compared with rural areas. In practice, this effect is bigger when using the log of real minimum wage as the minimum wage measure compared to using the other measures. Using the log of real minimum wage, it is suggested that an increase in the proportion of workers in the urban areas by 10% increases the average monthly wage paid to the workers by 6.3%.

The effects of the proportion of workforce in the manufacturing and trade sectors are significantly negative to the average wage. A deep economic recession at the end of the 1990s seems to be the main reason for this negative effect of the manufacturing and trade sectors especially in the highly import-dependent manufacturing sector. As pointed out by Islam (2002), the real wages of workers in the manufacturing and trade sectors in Indonesia declined by 7% per year during the 1997-2000 period.

In terms of educational attainment, the proportion of the workforce with university qualifications is strongly and positively associated with the average wage. As pointed out by Feridhanusetyawan and Gaduh (2000), this is due to the scarcity of skilled labour in Indonesia. Using the log of real minimum wage measure, the result suggests that an increase in the proportion of the workforce with university qualifications by 10% increases the average monthly wage paid to the workers by 14.4%. In addition, relating to the demand side, the unemployment rate shows a significant negative effect, although it is only significant at 10% level. Regarding unemployment rate variable, I have tried to use the log of the lagged unemployment rate instead of using the lagged unemployment rate, as suggested by the wage curve literature, but the result is insignificant.

The log of real minimum wage and the fraction affected consistently show a positive and significant effect on the average wage. On the other hand, similar to the results from the simple fixed effect estimates, the fraction below and the fraction at measures show unexpectedly negative effects of the minimum wage. These results are consistent with the simple fixed effect estimates, suggesting that the fraction below and the fraction at measures are less effective in measuring the effects of minimum wage on average wage.

As mentioned above, the PCSE estimate theoretically provides a well-suited specification. However, the estimated coefficients of the minimum wage measures are relatively similar. Using the log of real minimum wage, it is suggested that a 10% increase in minimum wage increases the average wage by 1.67%, while using the fraction affected, it is suggested that an increase in minimum wage by 10% increases the average wage by 1.07%[21]. Similarly to the simple fixed effect estimate, we can conclude that the coefficient of the log of real minimum wage is higher than the fraction affected measure, suggesting that the log of real minimum wage measure will potentially provide a stronger effect on employment than the fraction affected.

Simple fixed effects and PCSE estimates discussed above generally assume that the minimum wage measures are exogenous. The potentially biased estimate will arise if

[21] Similarly to the previous section, this coefficient is obtained after multiplying the raw coefficient of the fraction affected and the fraction affected elasticity with respect to the log of real minimum wage, as suggested by Lemos (2004d).

the minimum wage measures are endogenously determined with the labour market condition. If the minimum wage measures are endogenous, the OLS estimate (simple fixed effects and PCSE estimates) will not only biased but also provide an inconsistent estimate.

Although Rama (2001) argued that the index of minimum living needs (KHM), as the main consideration to set the Indonesian minimum wage, is not directly affected by labour market conditions, Suryahadi et al (2001) found that the real minimum wage in Indonesia is endogenously determined with real wages because in practice the existing wage rate are also used as one of the considerations for regional government to set their minimum wage level. In addition, Lemos (2004d) also found that the spike measure (the fraction at) tends to be endogenously determined with wages in the case of Brazil because in practice wage bargaining decides which workers are paid at (around) the minimum wage level. If there is evidence of endogeneity, then it is important to control for this bias using the instrumental variable method.

5.5.1.3 Instrumental Variable Method

In order to ensure whether the minimum wage measures used in the previous estimates are endogenously determined with average wages, the Davidson-MacKinnon test of endogeneity for panel data is reported in this section. If the null hypothesis is rejected, it would imply that the minimum wage measure is endogenously determined with wage, and therefore an instrumental variable is required, suggesting that the OLS (PCSE) estimates which assume the exogenous minimum wage are biased. In contrast, if the null hypothesis is accepted, it means that the minimum wage measure is exogenously determined with wage and hence the previous section estimates are unbiased and consistent.

Table 5.5 Davidson-MacKinnon Tests of Endogeneity for a Panel Data regression

Minimum Wage Measure	Chi-Squared
Log of Real Minimum Wage	13.182 (0.00)
Fraction Affected	0.761 (0.38)
Fraction At	4.800 (0.03)
Fraction Below	4.176 (0.04)

Notes: H_0: OLS estimator yield a consistent estimate

The results from Davidson-MacKinnon tests for endogeneity are reported in table 5.5[22]. The result confirms that the log of real minimum wage is suffered from endogeneity as the null hypothesis that OLS yield a consistent estimate is rejected at 1% level. In practice, this is consistent with the results obtained by Suryahadi et al (2001) in the previous Indonesian minimum wage study. Suryahadi et al (2001) argued that the existing average wage is considered as one of the important factors for regional government to set their minimum wage level, suggesting that the minimum wage and the average wage are simultaneously determined. The other potential reason is because both average wage and minimum wage are employed in real terms with the same denominator (consumer price index). This implies that they potentially move together in a similar way across the business cycles, suggesting a strong simultaneous correlation between average wage and minimum wage.

On the other hand, the fraction at and the fraction below measures also tend to be endogenous. This result is similar to results obtained by Lemos (2004d), which found that the spike (the fraction at) is endogenously determined with wages in the case of

[22] The Davidson-MacKinnon test is estimated using DMEXOGXT Stata command with a lagged value of the minimum wage measure as the instrumental variable.

Brazil. As pointed out by Lemos (2004d) the fraction at is endogenously determined with wage and employment because of the wage bargaining process (see above). Relating to the fraction below measure, it seems that an exogenous labour demand shift has potentially induced the extent of non-compliance, suggesting a potential endogenous correlation between the fraction below and the labour market condition. This extent of non-compliance can also be viewed as a displacement effect from the covered sector to the uncovered sector as a result of exogenous labour demand shift.

In contrast, there is no evidence that the fraction affected is endogenously determined with average wage, suggesting that the fraction affected is exogenous with respect to the average wage. In practice, the fraction affected primarily depends on the size of the minimum wage increases and are less likely to depend on the average wage. This result is consistent with Brown's (1999) argument that the fraction affected is relatively a cleaner measure of minimum wage than toughness as it directly measures workers affected by the minimum wage. In addition, the size of the minimum wage increases in Indonesia primarily depend on the minimum basic living needs index changes, suggesting that the fraction affected measure is less affected by labour market conditions.

In order to deal with the endogeneity problem of the minimum wage measures, the wage equation is re-estimated using the instrumental variable method with the fixed effects specifications. The instrumental variable method requires that the instrument is strongly correlated with the minimum wage measure (the endogenous independent variable) but it is not directly correlated with the error terms in the wage equation (in the second-stage estimation). Lemos (2005) used political variables as the instrumental variables for the minimum wage measures in the case of Brazil. However, political variables at the regional level might not be a valid instrument for Indonesia as the political regime tended to be strongly centralized particularly before 1999 during Soeharto's regime.

Table 5.6 Wage Equation using IV Method (First-stage estimation)
Instrumental Variable: Minimum wage level in the bordering provinces

	Log of Real Minimum Wage (1)		Fraction At (2)		Fraction Below (3)	
	Coef	P value	Coef	P value	Coef	P value
MW Bordering Regions (-1)	0.1014	0.147	0.0032	0.681	0.0247	0.461
Urban	-0.1174	0.508	-0.0442	0.028	-0.3324	0.000
Youth	-1.0043	0.072	-0.0494	0.433	-0.3427	0.200
Women	0.1464	0.777	-0.0149	0.799	0.4141	0.097
Industry	-0.2104	0.689	0.0631	0.290	0.1994	0.431
Trade	0.4022	0.412	0.0603	0.277	0.7311	0.002
Services	0.1025	0.842	-0.0831	0.155	0.1163	0.638
Construction	0.7217	0.511	0.0509	0.682	0.5411	0.305
Highschool	-0.2386	0.514	-0.0490	0.237	-0.1285	0.465
University	1.1798	0.288	0.2034	0.106	0.2500	0.639
Unempl (-1)	-1.0790	0.060	0.0556	0.391	-0.0108	0.969
Year 1991	-0.8150	0.000	-0.0188	0.069	-0.0954	0.030
Year 1992	-0.5675	0.000	-0.0052	0.588	-0.0195	0.634
Year 1993	-0.5428	0.000	-0.0055	0.499	-0.0305	0.379
Year 1994	-0.4546	0.000	-0.0038	0.626	-0.0060	0.856
Year 1995	-0.2470	0.000	-0.0046	0.505	0.0510	0.082
Year 1996	-0.1558	0.025	-0.0041	0.598	0.0571	0.087
Year 1997	-0.1555	0.003	-0.0071	0.226	0.0202	0.415
Year 1998	-0.1493	0.006	-0.0034	0.570	0.0142	0.581
Year 1999	-0.4559	0.000	-0.0070	0.181	-0.0238	0.281
Year 2000	-0.4583	0.000	-0.0098	0.084	-0.0436	0.070
Year 2001	-0.2784	0.000	-0.0150	0.007	-0.0451	0.056
Year 2002	-0.1426	0.001	-0.0086	0.069	-0.0306	0.128
Year 2003	-0.0425	0.233	-0.0099	0.015	-0.0095	0.579
Constant	10.3188	0.000	0.0392	0.679	-0.1558	0.698
Observations	364		364		364	
Number of Areas	26		26		26	
Within group R-sq	0.839		0.208		0.456	
F test	68.13 (0.00)		3.44 (0.00)		10.96 (0.00)	

Note: Dependent variable is the minimum wage measure. All regressions include province dummies.

In contrast, Neumark and Wascher (1992) employed the one year lag of minimum wage level in the bordering regions as the instrument variable for minimum wage measure. Contrary to Neumark and Wascher (1992), my study found that the one year lagged value of the average minimum wage level in the bordering provinces is not a good instrument for Indonesian case. Table 5.6 presents the first-stage estimation of the instrumental variable method using the one year lagged value of the average minimum wage level in the bordering provinces as an instrument for the minimum wage measure[23]. As presented in table 5.6, the instrument variable is not significantly different from zero in all specifications, suggesting that the instrument is relatively weak because it is not strongly correlated with the minimum wage measure. The potential problem with using this instrument is that consumption packages used to measure the minimum wage level in Indonesia can be traded easily across provinces suggesting that bordering provinces might have similar business cycles (Rama, 2001).

As an alternative, following Suryahadi et al (2001) for Indonesia and Gindling and Terell (2006) for Honduras, this study instruments the minimum wage measure using one period lagged value of its minimum wage measure in each specification. Using the lagged value of the minimum wage measure as an instrument is theoretically appropriate as it is strongly correlated with the minimum wage measure and is not determined by the labour market in the current period. Lemos (2005) argued that the lagged value of the minimum wage is not a valid instrument for Brazil as there is evidence of serial correlation. However, there is no evidence of serial correlation for the Indonesian case suggesting that the lagged value of the minimum wage is a suitable instrument.

---

[23] The fraction affected estimate is excluded from the instrumental variable method as there is no evidence of endogeneity with the average wage.

Table 5.7 Wage Equation using IV Method (First-stage estimation)
Instrumental Variable: One year lag of its minimum wage measure

	Log of Real Minimum Wage (1)		Fraction At (2)		Fraction Below (3)	
	Coef	P value	Coef	P value	Coef	P value
MW Measure (-1)	0.5237	0.000	0.1212	0.038	0.3833	0.000
Urban	-0.1544	0.307	-0.0408	0.042	-0.2790	0.001
Youth	-0.5623	0.233	-0.0461	0.457	-0.2681	0.276
Women	0.2660	0.547	-0.0201	0.730	0.4394	0.058
Industry	-0.3123	0.486	0.0517	0.384	0.1578	0.502
Trade	0.5185	0.214	0.0511	0.354	0.6176	0.005
Services	0.3600	0.412	-0.0771	0.184	0.1660	0.471
Construction	0.3584	0.701	0.0681	0.582	0.4176	0.394
Highschool	-0.1965	0.525	-0.0492	0.228	-0.1718	0.289
University	1.1688	0.213	0.1927	0.121	0.1290	0.793
Unempl (-1)	-0.8148	0.095	0.0528	0.411	-0.0027	0.992
Year 1991	-0.4208	0.000	0.0138	0.000	0.0686	0.000
Year 1992	-0.2123	0.001	0.0130	0.001	0.0386	0.016
Year 1993	-0.2924	0.000	0.0148	0.000	0.0661	0.000
Year 1994	-0.2302	0.000	0.0143	0.002	0.1133	0.000
Year 1995	-0.0728	0.150	0.0152	0.020	0.0999	0.000
Year 1996	-0.0750	0.198	0.0122	0.018	0.0655	0.004
Year 1997	-0.1046	0.018	0.0167	0.003	0.0709	0.002
Year 1998	-0.1127	0.014	0.0127	0.018	0.0309	0.175
Year 1999	-0.4294	0.000	0.0095	0.112	0.0224	0.357
Year 2000	-0.3122	0.000	0.0048	0.466	0.0343	0.192
Year 2001	-0.0902	0.024	0.0118	0.074	0.0518	0.051
Year 2002	-0.0263	0.441	0.0101	0.154	0.0726	0.011
Year 2003	-0.0019	0.949	0.0202	0.006	0.0769	0.009
Constant	5.4006	0.000	0.0516	0.061	-0.0547	0.617
Observations	364		364		364	
Number of Areas	26		26		26	
Within group R-sq	0.883		0.219		0.530	
F test	98.83 (0.00)		3.66 (0.00)		14.76 (0.00)	

Note: Dependent variable is the minimum wage measure. All regressions include province dummies.

Table 5.7 presents the first-stage of the instrumental variable method results using one year lag of its minimum wage measure as an instrument variable. As presented in table 5.7, the instrument is significant and positive in all specifications, indicating that the first-stage estimation is plausible. In addition, the F test of joint significance of the instrument in the first-stage estimation is used to measure the quality of instruments. As pointed out by Staiger and Stock (1997), a large F statistic (above the rule of thumb of ten) implies that the instrument is strong in explaining the endogenous variable variation. The F test of the first-stage estimation for the log of real minimum wage and the fraction below measures are relatively high indicating a strong instrumental variable. In contrast, the F test for the fraction at measure is low (below the often-used threshold of ten), suggesting that a one year lag of the fraction at is a weak instrument for the fraction at[24]. This result supports the previous section finding that the fraction at is not an effective minimum wage measure for Indonesian case.

Table 5.8 presents the second stage of the instrumental variable method results for wage equation using different minimum wage measures. As presented in the first column, the log of real minimum wage shows a consistently positive effect on average wage. It is suggested that an increase in the real minimum wage by 10% raises the real average wage by 2.61%. Compared to the PCSE estimate, the estimated coefficient is slightly higher suggesting a downward bias in the OLS estimator. In contrast, Williams and Mills (2001) and Gindling and Terrell (2007) argued that the estimated coefficient should be upwardly biased as governments are likely to increase the minimum wage level when the economy is in a good condition. However, this is not the case of Indonesia as the minimum wage tends to be adjusted (increased) every year depending on the minimum basic living need index (KHM) regardless of the regional economic performance.

[24] I have also tried to use a one year lag of the log of real minimum wage as the instrument variable for the fraction at, but the result remains the same, suggesting a weak instrument for the fraction at.

Table 5.8 Wage Equation using IV Method (Second-stage estimation)
Instrumental Variable: One year lag of its minimum wage measure

	Log of Real Minimum Wage (1)		Fraction At (2)		Fraction Below (3)	
	Coef	P value	Coef	P value	Coef	P value
MW Measure	0.2613	0.002	-4.8939	0.209	0.1648	0.522
Urban	0.7738	0.000	0.5267	0.026	0.7978	0.000
Youth	-0.3444	0.441	-0.9003	0.097	-0.5776	0.208
Women	0.2511	0.542	0.2169	0.649	0.2214	0.612
Industry	-1.2544	0.003	-1.0146	0.059	-1.3496	0.002
Trade	-1.6016	0.000	-1.2113	0.016	-1.6223	0.000
Services	-0.1224	0.765	-0.5083	0.374	-0.1180	0.779
Construction	0.7974	0.362	1.2656	0.216	0.9129	0.314
Highschool	-0.1688	0.560	-0.4991	0.196	-0.2249	0.451
University	1.1638	0.187	2.5617	0.048	1.4807	0.100
Unempl (-1)	-0.6489	0.161	-0.6571	0.245	-0.9280	0.046
Year 1991	-0.0605	0.431	-0.2571	0.000	-0.0084	0.805
Year 1992	-0.1063	0.080	-0.1678	0.000	0.0437	0.107
Year 1993	-0.0773	0.178	-0.1217	0.000	0.1519	0.000
Year 1994	0.0108	0.838	0.0331	0.305	0.1771	0.000
Year 1995	-0.0116	0.784	0.0773	0.132	0.2150	0.000
Year 1996	0.0603	0.160	0.1292	0.000	0.2845	0.000
Year 1997	0.1203	0.005	0.2096	0.000	0.3477	0.000
Year 1998	-0.0473	0.355	-0.0544	0.155	0.1067	0.004
Year 1999	0.0288	0.572	-0.0056	0.908	0.1787	0.000
Year 2000	0.1449	0.005	0.1293	0.045	0.3405	0.000
Year 2001	0.2532	0.000	0.3101	0.000	0.4850	0.000
Year 2002	0.2211	0.000	0.3050	0.000	0.4793	0.000
Year 2003	0.2311	0.000	0.3789	0.000	0.5012	0.000
Constant	8.9144	0.000	12.1437	0.000	11.6248	0.000
Observations	364		364		364	
Number of Areas	26		26		26	
Within group R-sq	0.801		0.738		0.791	

Note: Dependent variable is measured as the log of real average wage.

On the other hand, the fraction at and the fraction below measures are not significantly different from zero using the instrumental variable method. These results, once again, suggest that these minimum wage measures are not effective in explaining the effect of minimum wage on average wage. As a result, we conclude that they are not valid measures of the minimum wage level for Indonesia in terms of wage equation. In other words, this conclusion suggests that the log of real minimum wage and the fraction affected is superior to the fraction at and the fraction below in measuring the minimum wage effect on the average wage.

5.5.1.4 Dynamic Arellano-Bond Method

In order to check the robustness of the result obtained by changing the methodology, as an alternative, this study attempts to use the one-step version of the Dynamic Arellano-Bond estimate in estimating the effect of minimum wage on average wage. In practice, the Dynamic Arellano-Bond method has some advantages. Firstly, it accounts for the lagged response of the dependent variable (i.e. the average wage) as a result of changes in the determinants of labour demand and supply. Arellano and Bond (1991) argued that the inclusion of the lagged dependent variable which is not correlated with the error term (based on orthogonality to the error process) provides a more efficient estimate because it provides more complete available information in the sample. In contrast, the instrumental variable and PCSE methods discussed above do not include this information, because the lagged dependent variable will be correlated with the error term of the equation, providing a biased estimate (Wooldridge, 2006). This is different with the Dynamic Arellano-Bond method, where first-differencing of the equation eliminated this correlation, providing a more efficient estimate, except if the error term is serially correlated. In addition, Neumark et al (2004) argued that the inclusion of the lagged dependent variable is also useful to measure a "sluggish" response (the speed of adjustment) of wage and employment to changes in labour demand and supply. Secondly, the lagged dependent variable coefficient can also be used in distinguishing the short-run and long-run effects of the minimum wage. The long-run effect of the minimum wage can be calculated as the minimum wage measure coefficient divided by one minus the lagged dependent variable coefficient

(Neumark and Wascher, 2004). Thirdly, similar to the instrumental variable method, it controls for endogeneity by using the instruments for the endogenous variable.

This section specifically focuses on the log of real minimum wage and the fraction affected measures, given the irrelevant results of the fraction at and fraction below measures from the previous section. Similar to the previous section, the log of the real minimum wage is treated as an endogenous variable by using the one year lagged value of the log of real minimum wage as an instrument, while the fraction affected is exogenously determined with average wage.

Table 5.9 shows consistently that the minimum wage has a positive significant impact on the real average wage using the log of real minimum wage and the fraction affected measures, suggesting that the positive effects of the minimum wage on average wage are robust across estimates. However, the lag of dependent variable is not significant using both minimum wage measures indicating that the labour demand and supply shifters (control variables) have a stronger impact in influencing the average wage than the lagged average wage itself. The other reason is because of the price index (the real average wage denominator) effects which tend to be fluctuated suggesting that the real average wage might not be positively and significantly affected by the lagged of the real average wage.

Table 5.9 Wage Equation using a Dynamic Arellano-Bond Estimate

	Log of Real Minimum Wage (1)		Fraction Affected (2)	
	Coef.	P value	Coef.	P value
Lrealwages (-1)	-0.0070	0.901	0.040	0.545
MW measure	0.1221	0.008	0.099	0.071
Urban	0.5037	0.000	0.440	0.004
Youth	-0.8638	0.055	-0.942	0.054
Women	-0.0991	0.828	-0.567	0.267
Industry	-0.9757	0.024	-0.992	0.039
Trade	-1.3060	0.001	-1.110	0.011
Services	0.3879	0.356	0.167	0.723
Construction	0.4442	0.608	-0.224	0.815
High School	-0.0056	0.984	-0.008	0.980
University	2.0130	0.035	2.558	0.014
Unemp. Rate (-1)	-0.3628	0.442	-0.320	0.539
Year 1991	0.0461	0.264	0.033	0.434
Year 1992	0.1012	0.003	0.088	0.010
Year 1993	0.0124	0.715	0.007	0.851
Year 1994	0.0316	0.500	0.014	0.775
Year 1995	0.0648	0.173	0.048	0.328
Year 1996	0.0587	0.098	0.040	0.254
Year 1997	-0.1919	0.000	-0.264	0.000
Year 1998	0.0661	0.109	0.045	0.274
Year 1999	0.1668	0.000	0.155	0.000
Year 2000	0.1261	0.000	0.108	0.002
Year 2001	-0.0067	0.843	-0.031	0.365
Year 2002	0.0303	0.390	0.007	0.842
Constant	-0.0104	0.700	0.001	0.965
Long Run Effect: MW measure	0.1212	0.009	0.1033	0.071
Observation	338		338	
Sargan Test	153.25 (0.94)		77.3 (0.83)	
2^{nd} order autocorrelation	-0.28 (0.78)		-0.10 (0.92)	

Note: Dependent variables are measured as the natural logs of the real monthly average wage. All regressions are estimated using Arellano-Bond one-step GMM estimator.

Compared to the previous section, the inclusion of the lag of the dependent variable in this estimate has somewhat lowered the coefficient of the log of real minimum wage and the fraction affected. Using the one-step version of Dynamic Arellano-Bond, the coefficient of the log of real minimum wage is 0.122, suggesting that a 10% increase in minimum wage leads to a 1.22% increase in the real average wage. On the other hand, the fraction affected coefficient is also positive with the coefficient of 0.099, but it is only significant at 10% level. This result implies that the result using the log of real minimum wage measure is more robust than using the fraction affected measure. In addition, the long-run effects of the minimum wage on the real average wage are also positive and significant. As noted above, the long-run effect is calculated as the minimum wage measure coefficient divided by one minus the lagged real average wage coefficient, while the p-values (and the estimated standard error) are based on the delta method, an approximation for inference on the size of the long run effects appropriate in large samples (see Papke and Wooldridge, 2005)[25]. Using the log of real minimum wage masure, it is suggested that an increase in minimum wage by 10% increases the real average wage by 1.21% in the long run.

In order to check the robustness of the estimates, diagnostic tests for second-order autocorrelation and the Sargan test of over-identifying restrictions as recommended by Arellano and Bond (1991) are undertaken over the estimates (see lower part of table 5.9). According to them, the presence of the first-order autocorrelation does not imply an inconsistent model, but the second-order autocorrelation does. Moreover, the Sargan test is used to check the specification of the model and to check the potential heteroscedasticity problem. As a result, we can reject the null hypothesis of the second-order autocorrelation (the p-values of both estimates are large) indicating that both of the estimates are consistent. In addition, the null hypothesis of the Sargan test in both the log of real of minimum wage and the fraction affected specifications are also rejected, indicating that both estimates are well-specified. Therefore, we can conclude that the Dynamic Arellano-Bond estimates are robust in estimating the effect of minimum wage on average wage.

[25] It is estimated using the commands nlcom and testnl in the statistical program STATA.

In summary, the full results relating to the effect of minimum wage on average wage reveals that the log of real minimum wage and the fraction affected are the most effective measures for the Indonesian case. It is suggested that an increase in minimum wage by 10% increases the average wage by 1.22%-2.61% depending on the method used. In comparison, the log of real minimum wage shows consistently a positive significant effect on average wage across estimates but it is simultaneously determined with average wage, while the fraction affected is a cleaner measure of minimum wage with respect to the average wage effect, but it is only significant at 10% level using the dynamic Arellano-Bond method. The Dynamic Arrelano-Bond estimate generally is superior to the other estimates. In addition, the PCSE and simple fixed effect estimates suffer from the endogeneity bias and from the heteroscedasticity problem.

In comparison, Lemos (2005) argued that the degree of impact measures, including the fraction at, the fraction below and the fraction affected are generally well-suited measures for the Brazilian case, while the log of real minimum wage is not an effective measure due to the fact that the variations in the log of real minimum wage did not come primarily from the variation in minimum wage (as minimum wage did not vary across regions). Specifically, as pointed out by Lemos (2005), the fraction at is the best measure because it is directly affected by minimum wages and it is the "cleaner" measure of the minimum wage than the other measures. This is actually different with the Indonesian case where the minimum wage varies across regions (provinces), suggesting that the log of real minimum wage is an appropriate minimum wage measure for Indonesia.

5.5.2 The Effect of Minimum Wage on Wages throughout the Distribution

Using a method similar to that used by Dickens et al (1999), this section examines the effect of minimum wage on wages throughout the distribution. Specifically, the average monthly wage as dependent variable is divided into each percentile (decile) in the wage distribution, while the independent variables follow the previous section estimates. In other words, the effect of minimum wage on wages is estimated at each decile in the wage distribution. Besides showing the full effect of minimum wage throughout the wage distribution, this investigation is also useful to check the effectiveness of different minimum wage measures relating to the wage effects. This section continues to compare the minimum wage measures using the dynamic Arellano-Bond method, given the biased estimate of the simple fixed effect and the PCSE methods findings.

Table 5.10 Effect on Wages Throughout the Distribution using Dynamic Arellano-Bond Estimates

	Log of Real Minimum Wage (1) Dynamic A-B		Fraction Affected (2) Dynamic A-B		Fraction At (3) Dynamic A-B		Fraction Below (4) Dynamic A-B	
Deciles	Coef	P value	Coef	P value	Coef	P value	Coef	P value
1st	0.014	0.863	0.205	0.038	-0.282	0.690	-0.947	0.000
2nd	0.063	0.291	0.260	0.001	-0.933	0.023	-0.767	0.000
3rd	0.051	0.349	0.372	0.000	-1.453	0.000	-0.693	0.000
4th	0.066	0.172	0.246	0.000	-1.438	0.000	-0.578	0.000
5th	0.115	0.008	0.194	0.000	-1.126	0.000	-0.395	0.000
6th	0.101	0.009	0.123	0.011	-1.226	0.000	-0.288	0.000
7th	0.079	0.013	0.087	0.029	-1.100	0.000	-0.156	0.020
8th	0.098	0.001	0.138	0.000	-0.864	0.007	-0.084	0.187
9th	0.047	0.191	0.116	0.017	-0.758	0.048	-0.081	0.283
Observation	338		338		338		338	
Number of Areas	26		26		26		26	

Note: Dependent variables are measured as the natural logs of the real monthly average wage at each decile point of distribution. Dynamic Arellano-Bond estimate results include year dummies and are estimated using Arellano-Bond one-step GMM estimator.

In the first column of table 5.10, the effect of minimum wage on wage throughout the distribution is estimated using the log of real minimum wage as the minimum wage measure. Similar to the previous section, the wage equation is instrumented using the one year lagged value of the log of real minimum wage in order to control for the endogeneity problem. The result shows that there is no significant effect of minimum wage at the lowest point of wage distribution. The main reason is the fact that there is a non-compliance issue with the minimum wage policy in Indonesia, which is likely to be found at the lowest part of the wage distribution. Specifically, the log of real minimum wage shows positive and significant effects only from the 5th to the 8th deciles of the distribution, while at the bottom and upper levels of the distribution the effects of minimum wage are not significantly different from zero. The result potentially suggests that the maximum impact is on the part of the distribution occupied by the minimum wage itself. In addition, the result also suggests the presence of spillover effect, where the minimum wage effect is strong up to the 8th decile. As pointed out by Card and Krueger (1995), the spillover effect is defined as an increase in the wages of workers who are already paid above the minimum wage level before the minimum wage increases. This effect is present due to the fact that the wage of workers who are already paid above the minimum wage level should not be the same level or lower than the minimum wage workers' wages. Compared to the other developing countries, Gindling and Terrell (2007) found significant effects throughout the distribution using the log of real minimum wage measure, also suggesting the presence of spillover effect, but the largest effect was in the 3rd decile of distribution.

Moreover, my result shows that the fraction affected has significant and positive effects on wages throughout the distribution, representing an extensive spillover effect. Consistent with the log of real minimum wage estimate, the effect of minimum wage is not strongest at the bottom of the distribution, suggesting that minimum wage is not effective in helping the lowest part of the wage distribution. Specifically, this result indicates an inverse U-shaped relationship of distribution where the 3rd decile is the highest point of the wage effects, confirming the part of the distribution mostly affected by the minimum wage policy. In comparison, the effect of minimum wage on average wage at the 30th percentile (0.372) is about three times bigger than at the 9th decile (0.116) These results are consistent with the view that the main goal of the Indonesian minimum wage seems to be an instrument for raising the standard of living of workers, suggesting an extensive "spillover effect" of the minimum wage (Manning, 2003a). Comparing this result to the similar fraction affected measure in the Colombian case, Arango and Pachon (2004) found a positive effect on the family income above the 25th percentile of family earnings distribution and between the 45th and 60th percentiles of the individual earnings distribution.

In the next two columns, the effects of minimum wage on wages throughout the distribution are estimated using the fraction at and the fraction below measures. Consistent with the previous section estimates, the fraction at and the fraction below shows irrelevant negative effects of minimum wage on wage throughout the distribution. Once again, these results confirm that the fraction at and the fraction below are poor measures of minimum wage effects on wages in the case of Indonesia. As a result, we can conclude that the log of real minimum wage and the fraction affected measures are generally more effective in estimating the effects of minimum wage on wage throughout the distribution.

5.5.3. The Effect of Minimum Wage on Employment

In this section, the effect of minimum wage on employment is estimated using a provincial panel data set from 1989 to 2003 across 26 provinces in Indonesia. This study focuses on the effect of a change in minimum wage on paid employment which is the category of employment legally covered by the minimum wage policy. Compared to the previous Indonesian minimum wage studies, Rama (2001) focused only on the impact of minimum wage on full-time workers, while Suryahadi et al (2003) focused on the urban formal labour market. In other words, this study provides a more complete specification of minimum wage effect on total paid employment in Indonesia which includes part-time workers and workers in rural areas which are in practice also legally covered by the minimum wage policy.

In the previous section, the findings showed that the effect of minimum wage on average wage is strongly positive and significant using the log of real minimum wage and the fraction affected measures. This is actually one indication that the minimum wage will also significantly affect employment. As pointed out by Burkhauser et al (2000), the significant effect of minimum wage on employment is likely to be found if there is a significant effect on wages. If the labour market is competitive, the effect of minimum wage on employment is expected to be negative.

Similar to the previous section, the effect of the minimum wage on employment is estimated using different measures of minimum wage, including: (a) the log of real minimum wage; (b) toughness; (c) the fraction below; (d) the fraction at; (e) the fraction affected. Toughness which is excluded from the wage equation because of potential spurious correlation with average wage will be employed as an alternative minimum wage measure in this section. The employment equation will also be estimated using four different alternatives of the panel data regression techniques, including the simple fixed effects, Panel-Corrected Standard Errors (PCSE), the instrumental variable and the Dynamic Arellano-Bond methods.

5.5.3.1 The Simple Fixed Effects

In the first section, following the same format as the wage equation, the employment equation is estimated using the simple fixed effects method. The dependent variable is the log of total paid employment that is employed in province *i* and year *t*, while the control variables tend to follow the wage equation except the unemployment rate which is excluded from the equation because of potential simultaneity bias with employment in the left-hand-side of equation. Table 5.11 reports a set of results of the effects of minimum wage on employment using five different measures of minimum wage.

Most of the control variables coefficients are significant and consistent across different specifications. The proportion of the labour force in urban areas has a negative and significant effect on total paid employment. This result indicates that a strong movement towards urbanization (from rural areas to urban areas) in the recent period tends to make it more difficult for the labour force find jobs as paid employment in the urban formal sector. This result also confirms that urban formal sector jobs are indeed limited.

Table 5.11 Employment Equation using Simple Fixed Effects Estimate
Dependent Variable: Total Paid Employment

	Log of Real Minimum Wage (1)		Toughness (2)		Fraction Affected (3)		Fraction At (4)		Fraction Below (5)	
	Coef	P value	Coef	P value	Coef	P value	Coef	P value	Coef	P value
MW measure	-0.0556	0.299	-0.0480	0.627	-0.1680	0.171	0.7734	0.114	-0.0039	0.974
Urban	-1.6974	0.000	-1.7050	0.000	-1.8611	0.000	-1.6527	0.000	-1.6929	0.000
Youth	1.3003	0.010	1.3491	0.008	0.5689	0.168	1.3659	0.007	1.3634	0.007
Women	-1.1349	0.021	-1.1246	0.022	-0.0093	0.984	-1.0894	0.026	-1.1231	0.023
Industry	1.0753	0.034	1.0901	0.034	0.7285	0.084	0.9863	0.051	1.0499	0.039
Trade	1.4097	0.004	1.4208	0.004	0.2416	0.555	1.3376	0.006	1.3981	0.005
Services	3.5455	0.000	3.5359	0.000	2.4886	0.000	3.5938	0.000	3.5443	0.000
Construction	2.9169	0.008	2.8783	0.008	2.8134	0.001	2.8639	0.009	2.8755	0.009
Highschool	0.5991	0.096	0.6195	0.085	0.4697	0.088	0.6528	0.069	0.6220	0.084
University	1.8759	0.063	1.8118	0.073	4.8306	0.000	1.6846	0.095	1.8191	0.072
Year 1990	-0.5222	0.000	-0.5253	0.000			-0.5256	0.000	-0.5276	0.000
Year 1991	-0.4211	0.000	-0.4335	0.000	0.6412	0.000	-0.4498	0.000	-0.4406	0.000
Year 1992	-0.3738	0.000	-0.3898	0.000	0.5681	0.000	-0.4063	0.000	-0.3962	0.000
Year 1993	-0.3295	0.000	-0.3515	0.000	0.5864	0.000	-0.3687	0.000	-0.3571	0.000
Year 1994	-0.2848	0.000	-0.3137	0.000	0.5984	0.000	-0.3352	0.000	-0.3231	0.000
Year 1995	-0.1737	0.008	-0.2043	0.000	0.6571	0.000	-0.2296	0.000	-0.2156	0.000
Year 1996	-0.1310	0.044	-0.1653	0.002	0.5500	0.000	-0.1871	0.000	-0.1760	0.001
Year 1997	-0.0799	0.232	-0.1160	0.032	0.5928	0.000	-0.1395	0.006	-0.1255	0.020
Year 1998	-0.0825	0.153	-0.1038	0.051	0.5281	0.000	-0.1231	0.015	-0.1116	0.034
Year 1999	-0.0842	0.142	-0.1041	0.050	0.5469	0.000	-0.1193	0.021	-0.1101	0.038
Year 2000	-0.0128	0.853	-0.0419	0.494	0.5754	0.000	-0.0539	0.363	-0.0485	0.424
Year 2001	-0.0894	0.218	-0.1273	0.035	0.4466	0.000	-0.1444	0.015	-0.1333	0.028
Year 2002	-0.1041	0.182	-0.1454	0.023	0.5182	0.000	-0.1650	0.007	-0.1539	0.016
Year 2003	-0.1335	0.106	-0.1773	0.009	0.5026	0.000	-0.2053	0.002	-0.1865	0.006
Constant	13.4108	0.000	12.8388	0.000	-0.5141	0.000	12.7801	0.000	12.8222	0.000
Observations	390		390		364		390		390	
Number of Areas	26		26		26		26		26	
Within group R-sq	0.736		0.735		0.756		0.737		0.735	
Diagnostic Tests:										
Test of heteroscedasticity	360.91 (0.00)		419.07 (0.00)		159.26 (0.00)		451.42 (0.00)		416.93 (0.00)	
Test of serial correlation	17.61 (0.00)		20.87 (0.00)		7.34 (0.01)		18.54 (0.00)		17.18 (0.00)	

Note: Dependent variables are measured as the log of total paid employment.
Wald test is used for group-wise heteroscedasticity with the null hypothesis of homoscedasticity.
Wooldridge test is used for first-order autocorrelation test with the null hypothesis of no first order autocorrelation.

The proportion of the youth labour force is positively associated with total paid employment. Indonesia Youth Employment Network (2003) found that young people are generally more likely to work in paid employed than self-employed category, although in many cases youth employees tend to be paid below the minimum wage level[26]. The potential reason that young people are less likely to be self-employed is because of their lack of entrepreneurship skills, and lack of access to credit loans or financial assistance from the official financial institutions required by most self-employed jobs (Indonesia Youth Employment Network, 2003).

On the other hand, the proportion of the female labour force is negatively associated with total paid employment. Compared to male workers, there is evidence that a high proportion of female workers works in the informal uncovered sector (as unpaid family workers, for example), particularly for female workers in rural areas, allowing them to combine employment with their domestic responsibilities that require more flexible working hours[27].

In terms of sector of activities, the coefficients are positive and significant. The strongest effect is found among workers in the services and construction sectors, indicating that a high proportion of workers in those sectors are in paid employment. Regarding educational attainment, the proportion of the workforce with high school and university qualifications has positive and significant effects on total paid employment. This result implies that skilled workers are more likely to work as paid employees in the formal sector, while unskilled workers tend to work in the uncovered informal sectors as self-employees or unpaid family workers, such as street traders, taxi drivers, or farmers in the agriculture sector.

---

[26] About 50% of Indonesian youth paid employees are paid below the minimum wage. See a detailed discussion about the effects of minimum wage on youth employment in the next chapter.

[27] In rural areas, the women unpaid family workers are about 45% of total labour force, while in urban areas it is more than 17%.

The coefficients of the minimum wage measures are negative but not statistically different from zero. This result is actually contrary to the prediction that the minimum wage will significantly reduce employment if the labour market is competitive. As noted above, in the absence of any unemployment benefits provided by the government, workers in the covered sectors who experienced job loss as the minimum wage increases tend to find a job in the uncovered sector which is paid below the minimum wage level rather than become unemployed. Therefore, the effects of changes in minimum wage on total paid employment might be less than had been predicted. Similarly, Lemos (2004d) also found difficulties in finding strong negative effects of minimum wage on employment in Brazil because of the non-compliance problem in the labour market.

Based on the above reasons, the effects of changes in minimum wage on employment using total paid employment is likely to be underestimated because it includes paid employment that earns a wage below the minimum wage level (paid employment in the uncovered sector). In practice, standard theory and developed countries' literature assumed that the minimum wage compliance is always high. This is not the case in Indonesia where the compliance is relatively low, given the lack of enforcement and the greater proportion of workers in the uncovered sector.

In order to obtain valid estimates of the minimum wage effects on employment in Indonesia, it is important to separate the covered sector employment from the uncovered sector employment as the focus of study (see Wessels, 2004). Using a method similar to that used by Wessels (2004), paid employment that is paid below the minimum wage level (paid employment in the uncovered sector) will be excluded from the sample[28]. In this case, Wessels (2004) found that the minimum wage has a stronger negative effect on the covered sector employment than on the overall employment in the United States.

Table 5.12 presents the estimation results for the effects of changes in minimum wage on paid employment in the covered sector. The dependent variable is therefore the log of number of paid employees who are paid at or above the minimum wage level (paid employment in the covered sector), while the independent variables follow the previous estimates. As predicted by the standard competitive model, the effect of minimum wage on paid employment in the covered sector is negative and significant using different minimum wage measures.

Using the log of real minimum wage, it is suggested that a 10% increase in minimum wage reduces paid employment in the covered sector by 4.60%. On the other hand, an increase in minimum wage by 10% increases toughness by 3.72%, suggesting a decrease in covered sector employment by 3.11%[29]. In terms of degree of impact measures, it is indicated that an increase in minimum wage by 10% increases the fraction affected and the fraction below by 3.70% and 3.09%, suggesting a decrease in covered sector employment by 3.88% and 4.04% respectively. The fraction at coefficient is also negative but only significant at 10% level. In comparison, the

[28] Although all paid employment is legally covered by the minimum wage policy in Indonesia, in this study, paid employees paid below the minimum wage level are classified as workers in the uncovered sector.

[29] Similarly to the wage equation, following Lemos (2005), the adjusted coefficients of toughness and degree of impact measures are obtained by multiplying the raw coefficients with the elasticity of each measure with respect to the log of real minimum wage in order to make it comparable with the log of real minimum wage coefficient.

findings suggest that the log of real minimum wage coefficient is larger than the coefficients of the other minimum wage measures.

Table 5.12 Employment Equation using Simple Fixed Effects Estimate Dependent Variable: Paid Employment in the Covered Sector

	Log of Real Minimum Wage		Toughness		Fraction Affected		Fraction At		Fraction Below	
	Coef	P value	Coef	P value	Coef	P value	Coef	P value	Coef	P value
MW measure	-0.4597	0.000	-0.8349	0.000	-1.0463	0.000	-1.0175	0.081	-1.3057	0.000
Urban	-1.3228	0.000	-1.5069	0.000	-1.7256	0.000	-1.3279	0.000	-1.6643	0.000
Youth	1.4903	0.008	1.7485	0.002	0.5843	0.171	2.0251	0.001	1.4587	0.005
Women	-1.5952	0.003	-1.5118	0.005	-0.1927	0.683	-1.5548	0.008	-1.0821	0.033
Industry	0.6970	0.209	1.1951	0.034	0.5447	0.211	0.5619	0.350	0.8072	0.122
Trade	0.5867	0.272	0.9088	0.092	0.0759	0.858	0.5467	0.345	1.3216	0.009
Services	3.5104	0.000	3.3594	0.000	2.2761	0.000	3.4308	0.000	3.6635	0.000
Construction	2.2990	0.054	2.0268	0.090	2.3539	0.008	1.9500	0.131	2.7143	0.016
Highschool	0.6245	0.114	0.7643	0.053	0.8007	0.005	0.7798	0.068	0.6054	0.103
University	1.7293	0.119	1.1430	0.303	5.7667	0.000	1.4266	0.235	1.6128	0.121
Year 1990	-0.5221	0.000	-0.5258	0.000			-0.5705	0.000	-0.5189	0.000
Year 1991	-0.4110	0.000	-0.4440	0.000	0.6638	0.000	-0.5642	0.000	-0.4263	0.000
Year 1992	-0.3368	0.000	-0.4072	0.000	0.6291	0.000	-0.5131	0.000	-0.3816	0.000
Year 1993	-0.2795	0.000	-0.4047	0.000	0.6239	0.000	-0.4974	0.000	-0.3341	0.000
Year 1994	-0.2324	0.000	-0.3782	0.000	0.6292	0.000	-0.5404	0.000	-0.3004	0.000
Year 1995	-0.1196	0.096	-0.2627	0.000	0.7047	0.000	-0.4548	0.000	-0.2063	0.000
Year 1996	-0.0047	0.947	-0.1843	0.002	0.6126	0.000	-0.3685	0.000	-0.1550	0.004
Year 1997	0.0657	0.370	-0.1401	0.019	0.6438	0.000	-0.2993	0.000	-0.0973	0.079
Year 1998	-0.0117	0.853	-0.1124	0.054	0.6641	0.000	-0.2417	0.000	-0.0854	0.115
Year 1999	-0.0036	0.955	-0.1090	0.062	0.6524	0.000	-0.2092	0.001	-0.0854	0.117
Year 2000	0.1545	0.041	-0.0218	0.746	0.6732	0.000	-0.1375	0.052	-0.0121	0.846
Year 2001	0.1121	0.160	-0.1422	0.032	0.5438	0.000	-0.2404	0.001	-0.1038	0.095
Year 2002	0.1032	0.228	-0.1547	0.028	0.5865	0.000	-0.2989	0.000	-0.1300	0.047
Year 2003	0.0823	0.364	-0.1910	0.011	0.5696	0.000	-0.3362	0.000	-0.1629	0.019
Constant	17.6679	0.000	13.0942	0.000	-0.4853	0.000	12.8592	0.000	12.8289	0.000
Observations	390		390		364		390		390	
Number of Areas	26		26		26		26		26	
Within group R-sq	0.703		0.701		0.756		0.652		0.737	
Diagnostic Tests:										
Test of heteroscedasticity	503.21 (0.00)		538.23 (0.00)		311.08 (0.00)		597.79 (0.00)		431.43 (0.00)	
Test of serial correlation	10.181 (0.00)		10.47 (0.00)		9.18 (0.01)		18.33 (0.00)		17.71 (0.00)	

Note: Dependent variables are measured as the log of paid employment in the covered sector.
Wald test is used for group-wise heteroscedasticity with the null hypothesis of homoscedasticity.
Wooldridge test is used for first-order autocorrelation test with the null hypothesis of no first order autocorrelatio

In order to check the robustness of the results, the diagnostic tests for serial correlation and heteroscedasticity are presented in the lower part of table 5.12. Similar to the wage equation, all of the simple fixed effect estimates suffer from the presence of the heteroscedasticity and serial correlation. Using the Wooldridge test for serial correlation, we reject the null hypothesis suggesting that there is evidence of serial correlation using the simple fixed effect estimates. On the other hand, using the Wald test for heteroscedasticity, the null hypothesis is also rejected indicating that there is evidence of heteroscedasticity over the estimates. Failure to control for these issues will make our estimates inefficient. The result also suggests an adoption of the Panel Corrected Standard Errors (PCSE) estimate that assumes heteroscedastic disturbances and allows for the presence of the first-order autocorrelation AR(1) parameter within the panel.

5.5.3.2 Panel Corrected Standard Errors (PCSE)

In this section, the effect of minimum wage on employment is examined using the Panel Corrected Standard Errors (PCSE) estimate. As mentioned above, PCSE estimate is expected to be more robust to the presence of heteroscedasticity and serial correlation than the simple fixed effect method. Table 5.13 presents a set of results of the effects of minimum wage on employment using different minimum wage measures. In panel A, similar to the simple fixed effect estimates, the result shows that the effects of changes in the minimum wage on total paid employment are not significantly different from zero using different minimum wage measures. However, as discussed in the previous section, this result is likely to be underestimated because it includes workers paid below the minimum wage level (paid employment in the uncovered sector). Therefore, it is important to separate paid employment in the covered sector from paid employment in the uncovered sector in order to obtain a valid estimate of the effects of minimum wage on employment in Indonesia.

The effect of the minimum wage on paid employment in the covered sector is presented in panel B of table 5.13. The full result suggests that the effects of changes in minimum wage on paid employment in the covered sector using different minimum wage measures are negative and significant, supporting the standard competitive model[30]. In comparison, the minimum wage measure coefficients using the PCSE method are slightly lower than using the simple fixed effect method. Using log of real minimum wage, it is suggested that an increase in minimum wage by 10% reduces paid employment in the covered sector by 4.17%. Comparing to the other measures, a 10% increase in minimum wage reduces paid employment in the covered sector by 2.55% using toughness, by 3.53% using the fraction affected and by 3.71% using the fraction below.

Relating to toughness, it is important to note that the average wage rate which is employed as a denominator also shows the interaction between labour demand and supply (Neumark and Wascher, 1992). This evidence suggests a potential simultaneous relationship between average wages in the right-hand-side of the equation and employment in the left-hand-side of the equation. By implication, the toughness estimate would potentially be biased because of this correlation, providing a spurious negative correlation between toughness and employment. In other words, toughness will

[30] The fraction at estimate is excluded given insignificant results in employment equation.

potentially generate a poor measure of the minimum wage effects on employment (Burkhauser et al, 2000).

Table 5.13 Employment Equation using Panel Corrected Standard Errors (PCSE) Estimate

Panel A: Dependent Variable: Total Paid Employment

	Log of Real Minimum Wage		Toughness		Fraction Affected		Fraction Below	
	1		2		3		4	
	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value
MW Measure	-0.0230	0.683	0.0303	0.762	-0.1651	0.178	0.0680	0.590
Urban	-1.8131	0.000	-1.8031	0.000	-1.8160	0.000	-1.7954	0.000
Youth	0.8608	0.069	0.8861	0.061	0.7112	0.118	0.9024	0.059
Women	-0.8016	0.060	-0.8034	0.057	-0.1650	0.698	-0.8197	0.052
Industry	0.8315	0.081	0.7955	0.101	0.9766	0.030	0.7996	0.099
Trade	0.9156	0.074	0.9006	0.081	0.2872	0.504	0.8805	0.088
Services	3.2755	0.000	3.2721	0.000	2.3928	0.000	3.2578	0.000
Construction	3.0095	0.002	3.0051	0.002	2.2275	0.015	2.9865	0.002
High School	0.6911	0.027	0.7029	0.023	0.4461	0.114	0.7138	0.020
University	3.1579	0.001	3.1467	0.001	4.9780	0.000	3.1307	0.001
Constant	12.6710	0.000	12.4198	0.000	0.0191	0.731	12.4307	0.000
R sq	0.99		0.99		0.76		0.99	

Panel B: Dependent Variable: Paid Employment in the Covered Sector

	Log of Real Minimum Wage		Toughness		Fraction Affected		Fraction Below	
	1		2		3		4	
	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value
MW Measure	-0.4175	0.000	-0.6851	0.000	-0.9590	0.000	-1.2063	0.000
Urban	-1.5599	0.000	-1.6283	0.000	-1.6757	0.000	-1.7718	0.000
Youth	1.0619	0.037	1.3483	0.006	0.7706	0.091	0.9575	0.048
Women	-1.2194	0.010	-1.1942	0.013	-0.4256	0.343	-0.7982	0.073
Industry	0.5281	0.319	0.8539	0.123	0.7914	0.087	0.5999	0.220
Trade	0.3830	0.459	0.6150	0.279	0.1075	0.812	0.8143	0.121
Services	3.1526	0.000	3.1756	0.000	2.3436	0.000	3.3231	0.000
Construction	2.4141	0.024	2.3392	0.030	1.6680	0.081	2.7194	0.006
High School	0.8463	0.010	0.8627	0.009	0.7712	0.005	0.6954	0.025
University	3.5022	0.001	2.3035	0.022	5.5792	0.000	3.0843	0.001
Constant	16.8870	0.000	12.6745	0.000	0.2031	0.000	12.4534	0.000
R sq	0.99		0.99		0.77		0.99	

Note: All regressions include year and province dummies and are estimated assuming a AR(1) error structure.

In order to check the robustness of the toughness estimate, the endogeneity test will be reported in the next section. This test is also useful to ensure whether all of the minimum wage measures are truly exogenous with respect to employment. If the minimum wage measures are endogenously determined with employment, it would imply that the PCSE estimates are not robust because it assumes exogeneity.

5.5.3.3 Instrumental Variable Method

Similarly to the wage equation, the Davidson-MacKinnon test of endogeneity is conducted to test whether the minimum wage measures are endogenously determined with employment. In this case, this section focuses on paid employment in the covered sector as a valid measure of employment for the Indonesian case. The results from the Davidson-MacKinnon test for endogeneity of minimum wage measures with respect to paid employment in the covered sector are reported in table 5.14.

The result shows that the log of real minimum wage is exogenously determined with employment as the Davidson-MacKinnon test strongly rejects the null hypothesis that the log of real minimum wage is endogenous. This result is consistent with Suryahadi et al (2001) and Rama (2001) in the previous minimum wage studies, confirming that the real minimum wage is not endogenously determined with employment because the main consideration to set the minimum wage level (index of minimum living needs) is not directly related to the regional labour market. As pointed out by Suryahadi et al (2001), the log of real minimum wage is only endogenous in the wage equation because regional government is likely to use the existing average wage level as one of the important factors to set the minimum wage level. In addition, Zavodny (1998) argued that the timing of minimum wage increases is likely to be related to the general economic condition, such as when demand for paid employment is high, suggesting that the minimum wage level is endogenously determined with employment. In practice, this is not the case of Indonesia as the minimum wage tends to be adjusted regularly (every year) depending on the index of minimum living needs.

Table 5.14 Davidson-MacKinnon Tests of Endogeneity for a Panel Data Regression

Minimum Wage Measure	F test
Log of Real Minimum Wage	0.119 (0.73)
Toughness	5.158 (0.02)
Fraction Affected	5.94 (0.01)
Fraction At	4.71 (0.03)
Fraction Below	2.40 (0.10)

Notes: H_0: OLS estimator yield a consistent estimate

On the other hand, as predicted, toughness is endogenously determined with employment. The result indicates that the endogeneity in toughness is caused by the correlation between denominator (the real average wage) and employment as there is no evidence of endogenous correlation between the real minimum wage and employment. This result is consistent with Dickens et al's (1999) finding that the toughness estimate is endogenously biased either because of real average wage (the denominator) or real minimum wage (the numerator). This result also confirms that the toughness measure is contaminated by the interaction between labour demand and supply, suggesting a poor measure of minimum wage on employment for the Indonesian case.

In addition, the Davidson-MacKinnon tests show that the fraction affected, the fraction at and the fraction below (degree of impact measures) estimates suffer from endogeneity bias. The main reason is because they measure the "group of paid employees" affected by the minimum wage suggesting a strongly simultaneous correlation with total number of paid employees in the left-hand-side equation.

Based on the above reasons, the PCSE estimates are not robust in estimating the effect of minimum wage on employment because of the presence of endogeneity bias. In order to deal with the endogeneity problem of the minimum wage measures, similar to the wage equation, the employment equation is re-estimated using the instrumental variable method with the fixed effect specification. In this case, the one year lag of its own minimum wage measure is employed as the instrument[31]. The log of real minimum wage measure is not estimated using the instrumental variable method as there is no evidence of endogeneity with respect to employment.

Table 5.15 presents the first-stage of the instrumental variable method results using different minimum wage measures. The instrument variables (the one year lag of its own minimum wage measures) are strongly positive and significant, except for the fraction affected specification, indicating that the first-stage estimates are appropriate. The F tests for joint significance of the instrument in the first-stage estimation are relatively high for the toughness and the fraction below specifications. In contrast, the F tests for the fraction at and the fraction affected are low (less than the rule of thumb of ten as pointed out by Staiger and Stock, 1997) implying that these specifications suffer from weak-instruments problem[32]. As a result, this result suggests focus on the toughness and the fraction below specifications in the second stage of the estimation which are more appropriate.

[31] For toughness, the one year lagged value of the log of real minimum wage is employed as an instrument in order to ensure that the toughness variation is primarily caused by the variation in the minimum wage.

[32] I have also tried to use the other instruments, such as the one year lag of the log of real minimum wage and the mean of the bordering provinces minimum wage level, but the F tests of the first-stage estimation remain low.

Table 5.15 Employment Equation using IV Method (First-stage estimation)
Instrumental Variable: One year lag of its minimum wage measure

	Toughness (1)		Fraction Below (2)		Fraction At (3)		Fraction Affected (4)	
	Coef	P value	Coef	P value	Coef	P value	Coef	P value
MW measure (-1)	0.1780	0.000	0.3833	0.000	0.1222	0.036	-0.0593	0.295
Urban	-0.3595	0.000	-0.2790	0.000	-0.0400	0.046	-0.0889	0.190
Youth	0.1009	0.711	-0.2688	0.257	-0.0327	0.584	-0.1327	0.495
Women	0.0440	0.865	0.4389	0.053	-0.0104	0.856	0.1180	0.593
Industry	0.6165	0.021	0.1581	0.497	0.0460	0.435	0.4515	0.023
Trade	0.7899	0.002	0.6176	0.005	0.0513	0.353	0.2297	0.230
Services	-0.0062	0.981	0.1659	0.470	-0.0764	0.187	0.1663	0.412
Construction	-0.2126	0.704	0.4174	0.394	0.0722	0.558	-0.3642	0.362
Highschool	-0.0006	0.997	-0.1721	0.278	-0.0428	0.285	0.0128	0.920
University	-0.0682	0.903	0.1289	0.793	0.1948	0.117	0.1919	0.662
Year 1991	0.0047	0.905	0.0686	0.000	0.0138	0.000	-0.0961	0.103
Year 1992	0.0964	0.008	0.0386	0.016	0.0130	0.001	0.0442	0.006
Year 1993	0.0368	0.245	0.0661	0.000	0.0148	0.000	-0.0165	0.315
Year 1994	0.0118	0.696	0.1133	0.000	0.0150	0.001	-0.0066	0.687
Year 1995	0.0773	0.006	0.0998	0.000	0.0180	0.001	0.0416	0.013
Year 1996	0.0776	0.027	0.0654	0.003	0.0132	0.008	-0.0161	0.429
Year 1997	0.0463	0.060	0.0709	0.002	0.0177	0.001	-0.0376	0.072
Year 1998	0.0147	0.567	0.0308	0.163	0.0139	0.008	-0.0364	0.030
Year 1999	-0.0293	0.177	0.0223	0.301	0.0118	0.026	0.0076	0.634
Year 2000	-0.0166	0.494	0.0342	0.157	0.0069	0.254	-0.0099	0.538
Year 2001	0.0154	0.513	0.0516	0.033	0.0141	0.020	0.0245	0.143
Year 2002	-0.0205	0.311	0.0724	0.004	0.0129	0.040	0.0534	0.002
Year 2003	0.0039	0.827	0.0768	0.004	0.0229	0.000	0.0355	0.024
Constant	-1.5720	0.000	-0.0543	0.603	0.0451	0.086	0.1292	0.000
Observations	364		364		364		364	
Number of Areas	26		26		26		26	
R square	0.516		0.530		0.217		0.263	
F test	14.62 (0.00)		15.45 (0.00)		3.79 (0.00)		4.51 (0.00)	

Note: Dependent variable is the minimum wage measure. All regressions include province dummies.

The second stage of the instrumental variable method estimates for the employment equation is presented in table 5.16. Toughness and the fraction below show consistently negative effects of minimum wage on employment. Compared to the PCSE estimate, the toughness coefficient significantly decreases confirming a spurious negative correlation in PCSE estimate as predicted by Neumark and Wascher (1992). The results suggest that an increase in minimum wage decreased paid employment in the covered sector by 5.84% using toughness and by 5.4% using the fraction below. In contrast, the fraction affected and the fraction at are not significantly different from zero using the instrumental variable method.

Table 5.16 Employment Equation using IV Method (Second-stage estimation)
Instrumental Variable: One year lag of its minimum wage measure

	Toughness (1)		Fraction Below (2)		Fraction At (3)		Fraction Affected (4)	
	Coef	P value	Coef	P value	Coef	P value	Coef	P value
MW measure	-1.5660	0.000	-1.7307	0.000	-11.8607	0.091	-6.2963	0.251
Urban	-1.7085	0.000	-1.7386	0.000	-1.6777	0.000	-2.1648	0.001
Youth	1.2820	0.035	0.8102	0.143	0.9928	0.282	-0.3633	0.787
Women	-1.0710	0.065	-0.3372	0.527	-1.1052	0.190	0.7347	0.620
Industry	1.8484	0.004	1.1645	0.030	1.4967	0.116	2.9393	0.292
Trade	1.0673	0.085	1.1606	0.035	0.6150	0.501	1.1414	0.498
Services	3.0059	0.000	3.3570	0.000	2.1789	0.035	3.0089	0.048
Construction	2.4752	0.048	3.5525	0.002	3.2684	0.079	0.4766	0.876
Highschool	0.5506	0.176	0.3738	0.306	0.1008	0.880	0.8623	0.239
University	1.6374	0.192	2.1514	0.055	4.1508	0.079	7.2313	0.009
Year 1991	0.1638	0.003	-0.3924	0.000	-0.1586	0.157	-0.7792	0.189
Year 1992	0.1851	0.000	-0.2628	0.000	0.0521	0.347	0.3459	0.214
Year 1993	0.1802	0.000	-0.2261	0.000	0.0914	0.125	-0.0383	0.780
Year 1994	0.2696	0.000	-0.1640	0.002	0.0516	0.430	0.0304	0.754
Year 1995	0.4109	0.000	-0.1048	0.028	0.1774	0.051	0.2821	0.262
Year 1996	0.4826	0.000	0.0352	0.501	0.2178	0.002	0.0514	0.734
Year 1997	0.5098	0.000	0.0936	0.075	0.3297	0.000	-0.1516	0.507
Year 1998	0.5084	0.000	0.0901	0.133	0.3514	0.000	-0.1041	0.621
Year 1999	0.4872	0.000	0.0843	0.192	0.3629	0.000	0.1469	0.171
Year 2000	0.5770	0.000	0.1441	0.046	0.3615	0.000	0.0371	0.724
Year 2001	0.4453	0.000	0.0545	0.421	0.3236	0.000	0.2349	0.174
Year 2002	0.4743	0.000	0.0405	0.542	0.2636	0.003	0.2509	0.414
Year 2003	0.4536	0.000	0.0196	0.781	0.3426	0.004	0.1931	0.346
Constant	12.7924	0.000	12.6634	0.000	12.9772	0.000	0.7190	0.281
Observations	364		364		364		364	
Number of Areas	26		26		26		26	
R square	0.607		0.689		0.171		0.219	

Note: Dependent variable is the log of total paid employment in the covered sector

5.5.3.3 Dynamic Arellano-Bond Method

To check the robustness of the results by changing the methodology, the effect of minimum wage on employment is estimated using a one-step Dynamic Arellano-Bond method. According to Arellano and Bond (1991), it is recommended to use the one-step estimator for inference of the coefficient when the sample is relatively small. As mentioned above, this method includes the lagged values of employment as additional explanatory variables to measure the adjustment of employment to changes in labour demand and supply, providing a more efficient estimate than the instrumental variable method. Similar to the previous section, the one year lagged value of the minimum wage measure is included as an instrument to control for endogeneity problem, except for the log of real minimum wage which is exogenously determined with employment. The robust standard error is reported to control for the heteroscedasticity problem. This section specifically focuses on the log of real minimum wage, toughness, and the fraction below measures, given the insignificant results using the fraction affected and the fraction at in the previous section.

The effect of minimum wage on paid employment in the covered sector using the Dynamic Arellano-Bond method is presented in table 5.17. All of the minimum wage measures consistently show significant negative effects of minimum wage on employment. Compared to the PCSE and instrumental variable estimates, the coefficients fall slightly but remain negative and statistically significant. Using the log of real minimum wage, it is suggested that a 10% increase in minimum wage decreases paid employment in the covered sector by 3.01%. Compared to the log of real minimum wage, the adjusted coefficients of toughness and the fraction below are 0.233 and 0.356, suggesting that an increase in the minimum wage by 10% decreases paid employment in the covered sector by 2.33% and 3.56% respectively[33]. In addition, using the log of real minimum wage measure, an increase in minimum wage by 10% reduces paid employment in the covered sector by 4.14% in the long run.

Table 5.17 Employment Equation using a Dynamic Arellano-Bond Estimate

	Log of Real Minimum Wage (1)		Toughness (2)		Fraction Below (3)	
	Coef	P value	Coef	P value	Coef	P value
Employment (-1)	0.1364	0.016	0.2317	0.000	0.1664	0.000
Employment (-2)	0.1361	0.003	0.1441	0.001	0.1202	0.003
MW measure	-0.3010	0.016	-0.6052	0.000	-1.0445	0.000
Urban	-1.9199	0.000	-1.6214	0.000	-1.7580	0.000
Youth	0.5588	0.323	1.1380	0.046	0.9113	0.065
Women	-0.0771	0.927	-1.1733	0.045	-0.1503	0.769
Industry	1.0017	0.162	1.4253	0.009	1.3611	0.003
Trade	-0.3414	0.423	-0.2697	0.585	-0.1557	0.721
Services	2.5113	0.001	2.0515	0.000	2.4632	0.000
Construction	2.8251	0.091	1.5405	0.162	2.9433	0.002
High school	1.2496	0.000	1.1747	0.001	0.8163	0.005
University	5.8562	0.000	5.2908	0.000	4.6767	0.000
Year 1993	0.2083	0.000	-0.1206	0.032	-0.0661	0.180
Year 1994	0.1097	0.003	-0.1298	0.012	-0.0989	0.026
Year 1995	0.0895	0.067	0.0433	0.470	0.0309	0.552
Year 1996	0.2538	0.000	-0.1312	0.029	-0.1169	0.024
Year 1997	0.0623	0.378	-0.0961	0.066	-0.0636	0.165
Year 1998	0.1178	0.000	-0.1384	0.009	-0.1212	0.009
Year 1999	0.0188	0.804	-0.1169	0.025	-0.1045	0.022
Year 2000	0.0880	0.040	-0.0801	0.118	-0.0698	0.117
Year 2001	0.1727	0.008	-0.2519	0.000	-0.2132	0.000
Year 2002	0.0694	0.163	-0.1258	0.011	-0.1225	0.004
Year 2003	0.0797	0.249	-0.1374	0.006	-0.1156	0.008
Constant	-0.0776	0.028	0.1185	0.003	0.1065	0.002
Long Run Effect: MW measure	-0.4138	0.027	-0.9697	0.000	-1.4642	0.000
Observations	312		312		312	
Number of Areas	26		26		26	
2nd order autocorrelation	0.17(0.86)		1.41(0.16)		0.20 (0.84)	

Note: All regressions include year dummies and are estimated using Arellano Bond one-step GMM estimator.

[33] Similar to the previous section, the toughness and the fraction below elasticities are obtained by estimating each of them on the log of real minimum wage and all of the control variables in order to make it comparable with the log of real minimum wage coefficient.

Specifically, the Dynamic Arellano-Bond method is estimated using up to two lags of the employment[34]. The lagged values of the dependent variables are positive and significant, suggesting that the dynamic model dominates the OLS estimate. Relating to the potential autocorrelation caused by the lagged effects, the diagnostic test suggests that there is no evidence of the second-order autocorrelation in all of the estimates (see the lower part of table 5.17)[35]. This finding implies that the Dynamic Arellano-Bond estimates are robust and well-specified.

In summary, the full result suggests that a 1% rise in the minimum wage decreases paid employment in the covered sector by between 0.233% and 0.356% in the short run depending on the minimum wage measures used. The log of real minimum wage measure is generally "cleaner" than the other measures for Indonesian case because it does not suffer the endogeneity problem. In addition, the log of real minimum wage also shows consistently negative and significant effects of minimum wage on paid employment in the covered sector using different methods. In conclusion, we can confirm that the log of real minimum wage measure is the most appropriate measure in estimating the effect of minimum wage on employment, particularly when the minimum wage varies across regions. In contrast, it might be not useful when the minimum wage is set at a national level. Relating to the methods used, the Dynamic Arellano-Bond estimate generally is more efficient than the other estimates. As mentioned above, the other estimates suffer from endogeneity bias and do not include the adjustment of employment to changes in labour demand and supply, providing a less efficient estimate.

[34] I have tried to include up to three year lags of employment as additional explanatory variables, but the coefficients are not significantly different from zero.

[35] According to Arellano and Bond (1991), the first-order autocorrelation does not imply an inconsistent model, but the second-order autocorrelation does.

In comparison, the findings are relatively low compared to the evidences in Colombia and Puerto Rico. Bell (1997) found that a 10% increase in minimum wage in Colombia reduced low-paid unskilled labour by between 2% and 12%. In Puerto Rico, Castillo-Freeman and Freeman (1992) estimated that a 10% increase tended to reduce employment by over 9%. However, the results are higher than the evidence in Costa Rica and Brazil. In Costa Rica, the minimum wage reduced employment in the covered sector by between 0.4% and 1% (Gindling and Terrell, 2007). Finally, Lemos (2004d) suggested that a 10% increase in the Brazilian minimum wage increases total employment by 0.06% in the short run and decreases it by 0.04% in the long run.

5.5.4. Further Robustness Checks

5.5.4.1. Seemingly Unrelated Regression

In the previous section, the effects of changes in minimum wage on wage and employment are estimated separately (independently) using reduced forms of wage and employment equations. This specification assumes that the error terms between wage and employment equations are not contemporaneously correlated, while in practice, wage and employment are endogenous and have a close theoretical relationship to each other, suggesting that the error terms of two different equations might be correlated. In addition, the control variables of both equations are collected from the same set of the observations in the labour force survey, supporting the potentially strong error terms correlation across the equations. If the error terms across the equations are contemporaneously correlated, the joint equation estimate is required in order to gain efficiency (Pindyck and Rubinfeld, 1998).

Table 5.18 SUR Results for Wage and Employment Effects

	Total Paid Employment				Covered Sector Employment			
	Wage Effect (1)		Employment Effect (2)		Wage Effect (3)		Employment Effect (4)	
	Coef	P value	Coef	P value	Coef	P value	Coef	P value
Log Real MW	0.1666	0.000	-0.0560	0.261	0.3844	0.000	-0.4607	0.000
Urban	0.6773	0.000	-1.6914	0.000	0.4725	0.000	-1.3160	0.000
Youth			1.2554	0.007			1.4129	0.006
Women			-1.0485	0.020			-1.4868	0.003
Industry	-0.9973	0.006	1.0798	0.022	-0.7683	0.038	0.7058	0.172
Trade	-1.4733	0.000	1.4066	0.002	-0.9213	0.008	0.5852	0.239
Services			3.5079	0.000			3.4604	0.000
Construction			3.0314	0.002			2.4766	0.025
High School			0.5852	0.077			0.5986	0.101
University	0.8811	0.174	1.9127	0.041	0.5096	0.445	1.7878	0.083
Unemployment	-0.9643	0.011			-0.5934	0.131		
Year 1990	0.0764	0.002	-0.5215	0.000	0.0799	0.002	-0.5210	0.000
Year 1991	0.0582	0.039	-0.4202	0.000	0.0584	0.045	-0.4095	0.000
Year 1992	0.0977	0.001	-0.3737	0.000	0.0897	0.003	-0.3366	0.000
Year 1993	0.1952	0.000	-0.3295	0.000	0.1914	0.000	-0.2794	0.000
Year 1994	0.1976	0.000	-0.2854	0.000	0.1894	0.000	-0.2330	0.000
Year 1995	0.2346	0.000	-0.1734	0.004	0.2054	0.000	-0.1195	0.074
Year 1996	0.2815	0.000	-0.1321	0.029	0.2204	0.000	-0.0059	0.929
year 1997	0.3463	0.000	-0.0811	0.192	0.2835	0.000	0.0641	0.348
Year 1998	0.1507	0.000	-0.0835	0.120	0.1233	0.002	-0.0130	0.825
Year 1999	0.2237	0.000	-0.0848	0.111	0.1827	0.000	-0.0041	0.945
Year 2000	0.3613	0.000	-0.0150	0.815	0.2588	0.000	0.1517	0.031
Year 2001	0.4912	0.000	-0.0910	0.177	0.3911	0.000	0.1097	0.139
Year 2002	0.4733	0.000	-0.1055	0.145	0.3678	0.000	0.1013	0.203
Year 2003	0.4860	0.000	-0.1336	0.081	0.3634	0.000	0.0820	0.331
Constant	9.8210	0.000	12.9293	0.000	7.5399	0.000	17.3028	0.000
Observations	390		390		390		390	
Number of Areas	26		26		26		26	
R square	0.91		0.99		0.91		0.99	
Diagnostic Test: Breusch-Pagan	9.801 (0.002)				5.707 (0.017)			

Note: All regressions include province dummies and are estimated using Seemingly Unrelated Regression.

In order to check for this issue, the Breusch-Pagan test for cross-sectional correlation is reported (see the lower part of table 5.18). The result shows that we can reject the null hypothesis of the error term independence implying that the error terms of both equations are contemporaneously correlated. To control for this correlation, the reduced forms of wage and employment equations are estimated jointly using a system approach of the Seemingly Unrelated Regression (SUR), allowing the error terms to be correlated across different equations. Compared to the separate single-equation models, SUR improves the efficiency of estimates in the case that the error terms are highly correlated across different equations (Pindyck and Rubinfeld, 1998). Specifically, the wage and employment equations are estimated simultaneously by using Generalized Least Square (GLS) with the potential correlation in their error terms.

Table 5.18 presents a set of results for wage and employment effects using the SUR method. The log of real minimum wage is employed as the minimum wage measure, while the control variables tend to follow the previous section. Some variables that are insignificant based on the previous section wage equation finding are excluded including youth labour force, female labour force, and the workforce in the services and construction sectors. The unemployment rate is also excluded from the employment equation because of potential correlation with the dependent variable. In addition, year and province dummy variables are included to control for year and province specifics.

The effects of the minimum wage on wage and employment using total paid employment data are reported in columns 1 and 2 of table 5.18. The result shows that the effect of minimum wage on average wage of total paid employment is positive and significant. Specifically, it is suggested that a 10% increase in the minimum wage increases the average monthly wage of total paid employment by 1.66%. The coefficient is relatively very similar to the previous section's findings, suggesting a consistent estimate across different specifications. Consistent with the previous section finding, the effect of minimum wage on total paid employment is not significantly different from zero. The main reason is because of the non-compliance problem with the minimum wage policy in Indonesia, implying that total paid employment does not offer a valid measure of the employment effect of minimum wage in the Indonesian case.

Columns 3 and 4 of table 5.18 present the estimation results for the effects of minimum wage on paid employment in the covered sector. In this case, paid employment that earns a wage below the minimum wage level is excluded from the estimation, assuming that they are not covered by the minimum wage policy. The result shows that the minimum wage is positively associated with the average monthly wage of paid employment in the covered sector. Consistent with the prediction, the effect of minimum wage on average wage of covered sector employment is stronger than the average wage of total paid employment, implying that covered sector employment is more affected by the minimum wage than is total paid employment. The result suggests that a 10% increase in minimum wage increases the average wage of covered sector employment by 3.84%.

Turning to the employment equation, the effect of a change in minimum wage on paid employment in the covered sector is negative and significant. The coefficient is also relatively close to the previous section finding, suggesting that a 10% increase in minimum wage decreases covered sector employment by 4.6%. The full result also indicates a potential shift of the affected workers from the covered sector to the uncovered sector as there is no significant impact of minimum wage on total paid employment.

In summary, the SUR method provides more efficient estimates than a single equation model due to the fact that the error terms are contemporaneously correlated across wage and employment equations. The results are relatively close and consistent with the finding of the previous section suggesting an increase in average wage and a decrease in covered sector employment. However, it is important to note that the SUR method used in this section assumes exogeneity across variables and does not control for the endogeneity problem between the minimum wage and wage and/or employment. Therefore, although the SUR method provides more efficient estimates, it does not play an important role as an alternative specification relating to the endogeneity problem. As another alternative, the structural employment demand equation using the instrumental variable method to eliminate the endogeneity problem is discussed in the next section.

5.5.4.2. Structural Employment Demand Equations

In addition to estimating the effects of minimum wage on wage and employment simultaneously, this section examines the structural employment demand equation as suggested by Card (1992a) and Machin et al (2003). Specifically, employment is estimated on average wage, while minimum wage is used as an instrument for average wage[36]. As pointed out by Card (1992a), the change in employment in response to the wage change also reflects a movement along the labour demand function. This specification is consistent with the standard theory that minimum wage will affect employment if they first show the significant impact on the wage rate (Burkhauser et al, 2000). In other words, this specification implies that minimum wage leads to a

[36] Following the previous estimates, employment is measured by covered sector employment as the category of employment mostly affected by the minimum wage policy.

change in employment through the indirect channel of wage rate. Compared to the previous section which uses the separate (or jointly) reduced form equations, this specification provides a simple interaction between wage and employment, assuming that wage and employment are endogenous. Besides eliminating the endogeneity problem, this specification does not suffer from contemporaneous correlation across equations.

Specifically, the structural employment demand equation model used in this section has the following form:

First-stage estimation:

$$lnW_{it} = \alpha_0 + \alpha_1 \ln MW_{i-1t} + \psi_{it} X + \gamma_i + v_t + \varepsilon_{it} \tag{5.3}$$

Second-stage estimation:

$$lnEmp_{it} = \alpha_3 + \alpha_4 \ln W_{it} + \psi_{it} X + \gamma_i + v_t + \varepsilon_{it} \tag{5.4}$$

This model is estimated using the instrumental variable (two-stage least squares) method with the fixed effect specification. In practice, the instrumental variable method requires that the instrument is exogenous and uncorrelated with the error term in the employment equation. Since this study mostly found that the minimum wage measures are endogenously determined with wage and/or employment, the instrument (minimum wage measure) is employed with the lagged value in order to eliminate the potential biased estimate. Previous studies tended to allow for lagged response of the minimum wage on employment because of the difficulties of adjusting other inputs immediately (Brown et al, 1982). Machin et al (2003) employed the lagged value of the fraction of workers earning below the minimum wage level before the introduction of the minimum wage (the fraction affected) as an instrument variable, while Card

(1992a) used the fraction of teenagers affected by minimum wage before minimum wage increases. In addition to the lagged value of the fraction affected, the lagged value of the log of real minimum wage is also employed in this study as an instrument variable for average wage, while the exogenous control variables tend to follow the previous section. In order to check whether average wage is truly endogenously determined with employment, the Davidson and MacKinnon endogeneity test for a panel data estimate is also reported.

In the first-stage of estimation, the reduced form of wage equation is estimated by regressing the average monthly wage (W_{it}) on the minimum wage measure (instrumental variable), controlling for all other control variables (X) which are exogenous. If the lagged of minimum wage is a suitable instrument, it should have a strong and positive correlation with the average wage. In practice, the first-stage of estimation result will be similar to the wage equation estimation developed in the previous section using the fixed effect specification, except that the unemployment rate is excluded as one of the control variables due to the potential simultaneity bias with employment. In the second-stage of estimation, paid employment is regressed on the predicted value of the average monthly wage obtained in the first-stage estimation, controlling for all other explanatory variables. The coefficient of the predicted value of the average monthly wage (α_4) reflects the wage elasticity of labour demand (Machin et al, 2003).

Table 5.19 Wage Equation using Structural Estimate (First-stage estimation)
Dependent variable is measured as the log of real monthly average wage.

	Log of Real Minimum Wage (1)		Fraction Affected (2)	
	Coef	P value	Coef	P value
MW Measure (-1)	0.2545	0.000	0.8031	0.000
Urban	0.4818	0.002	0.3174	0.045
Youth	-0.9276	0.047	-0.6311	0.164
Women	0.5146	0.245	-0.3084	0.538
Industry	-0.9685	0.034	-0.7212	0.119
Trade	-0.7612	0.075	-0.6804	0.131
Services	-0.1292	0.773	-0.5773	0.198
Construction	1.3717	0.151	-0.1959	0.836
High school	-0.4009	0.196	0.2746	0.363
University	1.4437	0.132	2.8820	0.005
Year 1991	-0.3250	0.000	0.1139	0.004
Year 1992	-0.2726	0.000	0.0173	0.651
Year 1993	-0.2951	0.000	0.0425	0.277
Year 1994	-0.1739	0.001	0.1119	0.004
Year 1995	-0.1380	0.004	-0.0022	0.957
Year 1996	-0.1740	0.004	0.0544	0.261
Year 1997	-0.1424	0.001	-0.0039	0.937
Year 1998	-0.0886	0.044	0.0674	0.093
Year 1999	-0.3712	0.000	-0.3128	0.000
Year 2000	-0.2646	0.000	0.0037	0.923
Year 2001	-0.1087	0.007	0.0912	0.022
Year 2002	0.0326	0.345	0.1266	0.002
Year 2003	0.0007	0.981	-0.0355	0.345
Constant	9.3393	0.000	-0.0776	0.017
Observations	364		338	
Number of Areas	26		26	
Within group R-sq	0.801		0.478	
F test	55.15 (0.00)		12.55 (0.00)	
Diagnostic Test: Davidson & MacKinnon	9.94 (0.002)		55.36 (0.000)	

Note: All regressions include province dummies.

Table 5.19 presents the first-stage estimation of the structural employment demand equation. Both the lagged values of the log real minimum wage and the fraction affected (the instrumental variables) are estimated to be positive and are strongly correlated with the average monthly wage of covered sector employment, indicating that the first-stage of estimation is suitable. In addition, we argue that using the lagged value of the minimum measure is theoretically appropriate as it is not determined by the current labour market conditions. Moreover, the Davidson and MacKinnon tests also strongly reject the null hypothesis of exogeneity, confirming that employment is endogenously determined with average wage as predicted (see the lower part of table 5.20). The joint significances (the F tests) of both instruments in the first-stage estimation are higher than the rule of thumb of ten (Staiger and Stock, 1997), indicating that they are valid instruments. Specifically, the joint significance of the first-stage estimation is stronger using the one year lag of the log of real minimum wage as an instrument than using the one year lag of the fraction affected suggesting that the lagged value of the log of real minimum wage is a stronger instrument.

Table 5.20 presents the second-stage estimation of the structural employment demand equation. As predicted, the result indicates that the estimated wage elasticity is negative and significant. Using both minimum wage measures as an instrument, the wage elasticities are higher than one, suggesting that covered sector employment is very responsive to a change in the wage rate as the minimum wage increases. This result also implies that the employment effect of minimum wage is stronger than the wage effect itself. Specifically, wage elasticities of labour demand are -1.09 and -1.30 using one year lag of the log of real minimum wage and the fraction affected as instruments respectively. In comparison, Machin et al (2003) found a moderate size of wage elasticity in the United Kingdom low wage sector of between -0.35 and -0.55, while Card (1992a) found an insignificant result suggesting the presence of monopsony. The potential reason that Indonesia has higher wage elasticity of labour demand is because of the business' labour expenses are a high proportion of total costs compared to the proportion of fixed costs of capital.

Table 5.20 Employment Equation using Structural Estimate (Second-stage estimation)

Dependent variable is measured as the log of covered sector employment.

	Log of Real Minimum Wage (1)		Fraction Affected (2)	
	Coef	P value	Coef	P value
Ln Real Wages	-1.0954	0.000	-1.3028	0.000
Urban	-0.6177	0.023	-1.3121	0.000
Youth	0.1079	0.890	-0.2380	0.745
Women	-0.5762	0.392	-0.5945	0.444
Industry	-0.1779	0.807	-0.3949	0.581
Trade	-1.0036	0.140	-0.8105	0.254
Services	2.8741	0.000	1.5240	0.030
Construction	4.3107	0.004	2.0987	0.153
High school	0.1123	0.816	1.1585	0.014
University	3.3257	0.027	9.5215	0.000
Year 1991	0.0776	0.111	-0.4211	0.000
Year 1992	0.1676	0.003	0.1167	0.053
Year 1993	0.3346	0.000	0.1149	0.059
Year 1994	0.3607	0.001	0.2001	0.003
Year 1995	0.4621	0.000	0.0568	0.364
Year 1996	0.6174	0.000	0.2061	0.007
Year 1997	0.7530	0.000	0.0379	0.621
Year 1998	0.5110	0.000	0.1621	0.009
Year 1999	0.5866	0.000	-0.3131	0.001
Year 2000	0.7972	0.000	0.0877	0.142
Year 2001	0.8765	0.000	0.2224	0.001
Year 2002	0.8322	0.000	0.1392	0.067
Year 2003	0.8170	0.000	-0.0293	0.613
Constant	25.1213	0.000	-0.0168	0.699
Observations	364		338	
Number of Areas	26		26	
Within group R-sq	0.489		0.336	

Note: All regressions include province dummies.

Compared to the methods in the previous section, the structural employment demand equation provides evidence that the minimum wage affects employment indirectly through the wage rate, which is consistent with the standard theory. As mentioned above, standard theory suggests that minimum wage affects employment if there is a significant effect on the wage paid to the worker. Therefore, we argue that this specification is more complete and relevant than the model in the previous section using separate reduced form equations in explaining the effect of minimum wage on employment. In addition, this method does not suffer from the endogeneity problem and contemporaneous correlation across equations in separate reduced form equation. As a result, we argue that the structural employment demand equation is the more preferred specification, showing a simple interaction between wage and employment equations.

5.6. Conclusions

This chapter analyses the effects of changes in the minimum wage on wages and employment in Indonesia using a provincial panel data set from 1989 to 2003 across 26 provinces. Compared to the other developing country studies, the minimum wage policy in Indonesia provides a unique characteristic as the minimum wage is set differently across regions (provinces). Following Lemos (2004d and 2005), this study has applied five different measures of minimum wage using four standard panel data estimates, including the simple fixed effect, Panel Corrected Standard Error (PCSE), instrumental variable and Dynamic Arellano Bond estimates.

Although the findings vary across different measures and methods, generally they support the standard competitive model, suggesting that an increase in the minimum wage increases average wages and causes a reduction in covered sector employment. Unlike previous studies, the result shows that there is no significant impact of the minimum wage on total paid employment because of the non-compliance problem in Indonesia. This result implies that total paid employment is not a valid measure for the employment effect of minimum wage in Indonesia. Standard competitive market model always assumed that the minimum wage compliance is high and this is not the case with Indonesia where there is a high proportion of uncovered sector employment. This result suggests the usage of covered sector employment as a valid measure for the employment effect of minimum wage in Indonesia. In practice, the coefficients change dramatically when paid employment in the covered sector is used as the dependent variable.

Table 5.21 the Effects of Minimum Wage across Measures and Estimates

	Log of Real Minimum Wage (1)	Toughness (2)	Fraction Affected (3)	Fraction Below (4)	Fraction At (5)
Panel A: Wage Equation					
Simple Fixed Effects	0.1656 (0.00)	-	0.2935 (0.021)	-0.1599 (0.087)	-0.9075 (.019)
PCSE	0.1669 (0.00)	-	0.2881 (0.009)	-0.1766 (0.098)	-0.8040 (0.042)
Instrumental Variable	0.2613 (0.002)	-	-	0.1648 (0.522)	-4.839 (0.209)
Dynamic A-B	0.1221 (0.008)	-	0.099 (0.071)	-	-
Panel B: Employment Equation (Covered Sector)					
Simple Fixed Effects	-0.4597 (0.000)	-0.8349 (0.000)	-1.0463 (0.000)	-1.3057 (0.000)	-1.0175 (0.081)
PCSE	-0.4175 (0.000)	-0.6851 (0.000)	-0.9590 (0.000)	-1.2063 (0.000)	-
Instrumental Variable	-	-1.5660 (0.000)	-6.2963 (0.251)	-1.7307 (0.000)	-11.8607 (0.091)
Dynamic A-B	-0.3010 (0.016)	-0.6052 (0.000)	-	-1.0445 (0.000)	-

Table 5.21 presents a comparison table summarizing the basic results of wage and employment equations across measures and estimates which were analyzed above. In practice, the reduced forms of wage and employment are estimated separately (independently) in explaining the effects of minimum wage on wage and employment. Comparing minimum wage measures, the findings suggest that the log of real minimum wage is superior to the other measures. The log of real minimum wage consistently shows a significant impact across different estimates, providing well-suited measurement particularly when the minimum wage varies across regions. Although the log of real minimum wage is endogenous in the wage equation, it is exogenously determined with employment, providing a "cleaner" measure of the minimum wage effect on employment. Toughness suffers from the endogeneity bias because of its denominator effect (the real average wage), while the degree of impact

measures are endogenously determined with employment because they measure in a similar way with employment in the left-hand-side equation, providing a strongly simultaneous correlation with employment. Using the log of real minimum wage, it is suggested that an increase of the minimum wage by 10% increases the average wage of paid employment in the covered sector by 1.22%-2.61% and decreases covered sector employment by 3.01%-4.17%, depending on the method used.

In comparison across the basic model, the Dynamic Arellano-Bond method tends to provide a more efficient result using wage and employment equation as it measures the adjustment of employment to changes in labour demand and supply. In contrast, the PCSE and simple fixed effect estimates tend to suffer from the endogeneity problem as they assume exogeneity across variables.

In order to check the robustness of the result obtained by changing specification, the effect of the minimum wage on wages and employment is also estimated using different specifications, including the Seemingly Unrelated Regression (SUR) and structural employment demand equation. SUR is estimated due to the fact that the error terms across wage and employment equations are likely to be correlated. However, the SUR estimate does not control for the endogeneity problem in the minimum wage measures, suggesting that the results are potentially meaningless.

On the other hand, the structural employment demand equation estimate shows in a different way that the minimum wage affects employment indirectly through the wage rate, showing a simple correlation between wage and employment equations as predicted by the standard theory. In practice, this method does not suffer from the endogeneity problem and contemporaneous correlation across equations, providing a more efficient estimate than separate reduced form equations. As a result, we conclude that the structural employment demand equation is the more preferred specification compared to the previous estimates using separate reduced form wage and employment equations. In addition, although the specification differs from the previous estimate, the finding supports the previous evidence using separate reduced form equations that the minimum wage is positively associated with average wages and negatively associated with employment. The coefficient of minimum wage is also similar, suggesting that the findings are strong across different specifications.

Thus far, this chapter showed that an increase in minimum wage reduces paid employment in the covered sector (as part of the employment in the formal sector). This chapter therefore provided a basic analysis of the impact of minimum wage on wages and employment in Indonesia. A further area of research revealed by these findings is how the minimum wage policy affects employment in the uncovered sector. The effect of minimum wage on employment in the uncovered sector shows a displacement effect that might exist as the result of decreasing paid employment (the covered sector). The full effect of minimum wage on employment in the covered and uncovered sectors will be discussed in the next chapter.

CHAPTER VI

THE EFFECTS OF CHANGES IN MINIMUM WAGE ON WAGES AND EMPLOYMENT IN THE COVERED AND UNCOVERED SECTORS:

Evidence from Individual Micro-Level Data

6.1. Introduction

The previous chapter analysed the effects of changes in minimum wage on wages and total paid employment specifically in the covered sector using an aggregate provincial panel data set. In this chapter, I extend the analysis by examining the effects of changes in minimum wage on employment in the covered and uncovered sectors using an individual micro level data set. By estimating the effects of changes in minimum wage on employment in both the covered and uncovered sectors, this study provides a complete picture of the impact of minimum wage on the labour market in Indonesia, given a high proportion of uncovered sector employment in the case of Indonesia.

Compared to the previous chapter, the individual micro level data used in this chapter provides the possibility to explore the impact of the minimum wage across different sectors (or statuses) of employment among individual workers. However, unlike the previous studies using micro level data in developing country cases (see for example Fajnzylber, 2001; and Maloney and Nunez, 2001), this study cannot provide a panel of individuals due to data unavailability in Indonesia, so, as an alternative, a pooled cross-sectional time-series methodology will be employed. The previous developing countries study that is relatively close to this study's methodology is that of Gindling and Terrell (2005 & 2007) on Costa Rica.

Specifically, this chapter focuses on two main objectives. First, it examines the effects of changes in minimum wage on monthly wage paid to workers in Indonesia. Following a similar format to previous studies (see for example Maloney and Nunez, 2001; and Baanante, 2004), if we predict that an increase in minimum wage will affect employment, it must first have an impact on wage rates. Under the standard competitive model, we could expect that a higher minimum wage causes an increase in the wage paid to each paid employment, particularly when the minimum wage is binding. Similar to Gindling and Terrell (2007), the effect of minimum wage will also be explored across different points of the wage distribution. We could expect that the effect would be different throughout the wage distribution, and a larger effect should be expected to appear in the lower deciles (percentiles) of the distributions, indicating that the minimum wage is binding for workers that earn a wage at near the minimum wage level.

Second, this chapter explores the effects of changes in minimum wage on the probability of being employed in the covered and uncovered sectors. The objective of this section is to see how the distribution of workers across different sectors of employment changes as a result of an increase in minimum wage. As predicted by the two-sector model, there is a possibility that an increase in minimum wage will displace some workers affected by the minimum wage from the covered sector to the uncovered sector (see for example Gindling and Terrell, 2007; Arango and Pachon, 2004; and Baanante, 2004). In addition, as pointed out by Feridhanusetyawan and Gaduh (2000), in the case of Indonesia, without unemployment benefits provided by the government, displaced workers from the covered sector are likely to find a job in the uncovered sectors rather than become unemployed.

Relating to the second objective of this chapter, the labour market is distinguished into three main categories based on differential coverage of the minimum wage policy: (1) covered sector employment; (2) uncovered sector employment; and (3) unemployed. As an alternative, this study also distinguishes the labour market into four different statuses of employment, including: (1) self-employed; (2) unpaid family workers; (3) paid employment; and (4) unemployed. This is important because, in the case of Indonesia, the distinction between sectors covered and uncovered by the minimum wage policy is defined on the basis of employment status (Sukatrilaksana, 2002). In general, self-employment and unpaid family workers are grouped in uncovered sector employment, while paid employment is categorised as covered sector employment. However, it is possible to have paid employment in the uncovered sector because some workers are still paid below the minimum wage level. Further detail about the definition of the covered and uncovered sectors is presented in the research methodology section. In practice, previous studies have only focused on the effect of minimum wage on paid employment and self-employment (or formal and informal sectors) (see for example Maloney and Nunez, 2001; Baanante, 2004; and Gindling and Terrell, 2007), but not on the detail of each employment status.

The rest of this chapter is organized as follows. Section 6.2 discusses the previous minimum wage studies using individual level data. Section 6.3 explains the research methodology that is used in this chapter. Section 6.4 explains the data used in this study. Section 6.5 reports the main findings. The final section provides conclusions.

6.2. Previous Minimum Wage Studies Using Individual Micro-Level Data

In this section, the previous empirical studies on the effects of minimum wage on wages and employment using individual micro level data are reviewed separately in the case of developed and developing countries. In general, the main difference between the minimum wage in developed and developing countries is that the degree of compliance with the minimum wage policy is higher in developed countries, while in developing countries, including Indonesia, the compliance is likely to be low, given the lack of enforcement and the greater proportion of the informal uncovered sector (see Jones, 1997). In Indonesia, more than 20% of total paid employment is paid below the minimum wage level (paid employment in the uncovered sector).

6.2.1. Developed Country Studies

There are large numbers of empirical studies in developed countries on the impact of minimum wages using individual micro level data. One of the earliest influential studies of the minimum wage effect is the study of the "natural experiments" conducted by Card and Krueger (1994) in the United States. Using data from 410 fast-food restaurants, Card and Krueger investigated the impact of an increase in New Jersey's minimum wage on New Jersey and Pennsylvania (nearby states) employment by comparing the employment, wages, and prices at those restaurants before and after an increase in minimum wage. The methods used in their study included differences-in-differences and regression-adjusted model. In practice, they employed a New Jersey dummy variable and the wage gap between the new minimum wage and the initial wage to measure the minimum wage variable. As a result, contrary to the standard competitive model, they found that an increase in New Jersey's minimum wage raised the employment in the state, supporting the monopsony model. Evidence in support of a monopsony model was also found for California when Card (1992a) examined the effect of the state minimum wage on the young and less skilled workers. He found that an increase in the state minimum wage by 10% was associated with an increase in the employment-population rate of 2-6%.

Another influential study in the United States was conducted by Neumark et al (2004). Using an individual level panel data set from 1979 to 1997, Neumark et al (2004) employed the complete specification of the minimum wage ratio $\left[\frac{mw_t - mw_{t-1}}{mw_{t-1}}\right]$ for each workers' group position in the wage distribution to measure the minimum wage effect. Besides investigating the current effect of the minimum wage, they also estimated a lagged effect to examine the workers' condition one year after an increase in minimum wage. As a result, although wages of low-wage workers increased, they found that the employment and hours of work of the workers who initially received the minimum wage level in the previous year (t-1) declined as the minimum wage increased, indicating that the minimum wage was binding for these groups of worker. Compared to the other groups of worker, these groups were recognized as the most affected by an increase in minimum wage.

To compare the evidence in the United States with other developed countries, Abowd et al (1997) examined the transition probability among individual's employment status for youth employment in the United States from 1981 to 1987 and France from 1981 to 1989 using the individual panel data set. In contrast with a decrease in the United States real minimum wage, France experienced an increase in the real minimum wage during the sample period. Using a comprehensive multinomial logit model, they found that the effect of a change in the real minimum wage level in those countries was quite similar. In the United States, a decrease in the minimum wage by 1% was associated with an increase in the probability of the young men being employed of 2.2%, while an increase in the French minimum wage of 1% was associated with a reduction in the probability of the young men being employed of 2.5%, supporting the standard competitive model.

Currie and Fallick (1996) introduced a "wage gap" variable to identify a group of youth workers that was directly affected ("bound") by an increase in the 1979 and 1980 federal minimum wage in the United States. In this case, the wage gap variable is defined as the difference between the individual's earning in the previous period (t-1) and the new minimum wage level (t), given their previous earnings (t-1) are not below the old minimum wage level (t-1). As control groups, Currie and Fallick (1996) included those individuals with earnings less than the old minimum wage level, those individuals with earnings greater than the new minimum wage level, and those individuals employed in the uncovered sectors. The dependent variable was a binary variable, where employment is equal to 1 if the individual was employed in both year t-1 and year t, otherwise employment is equal to 0. Using both OLS and fixed effects estimation, they concluded that workers who were "bound" were about three percent less likely to remain employed in the following year as the minimum wage increased in 1979 and 1980.

Zavodny (2000) extended Currie and Fallick's (1996) model by estimating the effect of minimum wage on the change in wage and the probability of remaining employed. Comparing the data used by Currie and Fallick (1996), firstly, Zavodny (2000) used

CPS sample with greater sample periods (1979-1993). Secondly, individuals were classified as the workers affected by the minimum wage based on an increase in the real minimum wage rather than the nominal minimum wage. As a result, she found that an increase in minimum wage (the larger the wage gap) was more likely to increase the average real wage of the affected workers by US$ 2.31. In addition, using probit estimates, she concluded that an increase in minimum wage decreased the probability of remaining employed for the affected youth employment by 2.2%, indicating a smaller effect than in Currie and Fallick (1996).

Yuen (2003) examined the effect of minimum wages on youth employment using Canadian individual level panel data from 1988 to 1990. Similar to Currie and Fallick's (1996) method, Yuen (2003) employed a dummy variable of the individual directly affected by an increase in minimum wage as the minimum wage measure. The dummy variable is equal to 1 if the individual earning in the previous period is between the old and new minimum wage level ($mw_{it-1} < w_{it-1} < mw_{it}$), otherwise the dummy variable is equal to 0. As pointed out by Yuen (2003), the advantage of using the individual panel data set is that it makes it possible to investigate the individual transition probability from employed status in the previous period to non-employed (or employed) status in the following period. His results indicated that an increase in minimum wage of 8.4% was likely to decrease the number of low wage teenager workers by 7% and to decrease the number of low wage young adults by 10%.

A similar study was conducted by Kawaguchi and Yamada (2007) in Japan. In this case, they used Japanese individual level panel data with the fixed effect estimator to estimate the impact of minimum wage on female employment. They concluded that low wage female workers affected by an increase in minimum wage were 20 to 30 percent less likely to be employed in the following year, compared to low wage female workers not affected by an increase in minimum wage.

Based on the previous minimum wage studies in developed countries, as discussed above, we can see that the empirical results of the minimum wage effects generally can be viewed from two main frameworks, i.e. the standard competitive and the monopsony models. In addition, it is interesting to note that, although the minimum wage studies are conducted in the same country (for example the United States or the United Kingdom), there is no clear consensus about the direction and size of the minimum wage effects, depending on the methodology used and the object of study. This is actually one of the reasons why the minimum wage studies are still a challenging topic in the international literature, both in developed and developing countries. The evidence in developing countries is discussed in the next section where the minimum wage compliance is likely to be low, given the lack of enforcement and the greater proportion of the uncovered (informal) sector. In developing countries, therefore, the two-sector model might be more relevant rather than the standard competitive or monopsony models, showing a more complete analysis of workers in the covered and uncovered sectors.

Table 6.1 Summary of Previous Minimum Wage Studies Using Individual Micro Level Data in Developed Countries

Country/Author	Method	Minimum Wage Measure	Conclusion
United States: Card (1992)	Differences-in-differences estimates	Proportion of workers between old and new level of the minimum wage.	An increase in the state minimum wage was associated with an **increase** in the employment-population rate of 2-6% (monopsony).
United States: Card & Krueger (1994)	Differences-in-differences and regression–adjusted model	(1) Proportion of workers between old and new level of the minimum wage. (2) Wage Gap	An increase in the state minimum wage was associated with an **increase** in the employment (monopsony).
United States: Neumark et al (2004)	OLS; Fixed effect for each state-year	$\left[\frac{mw_t - mw_{t-1}}{mw_{t-1}}\right]$ for each worker's group position in the wage distribution	An increase in the minimum wage was associated with a **decrease** in the number of employment and hours of work of workers who initially received the minimum wage level in the previous year (t-1)
United States & France : Abowd et al (1997)	Multinomial Logit & Conditional Logit	Dummy variables for the real wage below the MW and the real wage between the old and new level of MW.	1. A decrease in the minimum wage by 1% was associated with an **increase** in the probability of young man being employed of 2.2% in United States. 2. An increase in the minimum wage by 1% was associated with a **reduction** in the probability of young man being employed of 2.5% in France
United States: Currie & Fallick (1996)	OLS and Fixed Effects estimates	Wage Gap Variable	An increase in the 1980 and 1981 minimum wage **decreased** the probability of remain employed in the following year by 3%.
United States: Zavodny (2000)	OLS and Probit estimates	Wage Gap Variable	An increase in the minimum wage **decreased** the probability of remain employed for the affected youth employment by 2.2%
Canada: Yuen (2003)	OLS and Fixed Effects estimates	Dummy variable of the individual directly affected by an increase in the minimum wage	An increase in the minimum wage of 8.4% was likely to **decrease** the number of teenager workers by 7% and young adults by 10%
United Kingdom: Stewart (2002)	Different-in-differences estimates	Individuals in the "high impact" and "low impact" regions	**No evidence** of an adverse employment effect in the "high impact" areas.
United Kingdom: Machin et al (2003)	Reduced-form model regression (using Instrumental Var.)	(1) Proportion of workers paid below the MW level (2) Wage Gap	The introduction of the minimum wage policy **reduced** the employment and hours of work in the residential care home sector.
Japan: Kawaguchi & Yamada (2007)	OLS and Fixed Effect	Dummy variable of the individual directly affected by an increase in the minimum wage	Low wage female workers affected by an increase in the minimum wage were 20 to 30 percentage points **less likely** to be employed in the following year.

6.2.2. Developing Country Studies

Compared to developed countries, empirical studies on the effect of minimum wage in developing countries are still limited. Most studies on the effects of changes in minimum wage on employment for developing countries generally support the standard competitive model in terms of adverse employment effects, particularly for the covered sector. However, as mentioned above, the two-sector (covered and uncovered sector) model might be more relevant to explain the effect of minimum wage than the simple single-sector standard competitive model, giving a more complete picture of the evidence in developing countries.

In developing countries, many of the recent minimum wage studies based on the micro level panel data set largely adopted the method developed by Neumark et al (2004). Using this method, some studies, including Maloney and Nunez (2001), Baanante (2004) and Fajnzylber (2001), made a number of improvements by comparing the evidence in the formal and informal sectors, given a high proportion of workers in the informal sector in the case of Latin American developing countries.

Maloney and Nunez (2001) compared the impact of changes in minimum wage on wage and employment of salaried workers (covered sector) and the self-employed (uncovered sector) throughout the distribution in Colombia using an individual panel data set. Unlike Neumark et al (2004), they found that the impact of an increase in minimum wage on salaried workers wage is not only significant for the worker groups near the minimum wage level but also for wages throughout the distribution, indicating a greater "spillover" effect in Colombia. As mentioned in the previous chapter, following Card and Krueger (1995), the spillover effect in this case is defined as an increase in the wages of workers who are already paid above the minimum wage level before the minimum wage increases. In addition, for the self-employed, unlike the salaried workers, the impact is only significant in the wage distribution below the minimum wage level. Moreover, they found that an increase in minimum wage raised the probability of becoming unemployed in the following quarter for the salaried workers throughout the wage distribution.

Baanante (2004) estimated the effects of changes in minimum wage on earnings and employment throughout the distribution in Peru using a quarterly panel data set. Specifically, he compared these effects on workers in the private formal sector, workers in the private informal sector, and independent workers. He modified Neumark et al's (2004) model using the interactions of dummy variable and the minimum wage level that identified each individual on their earning distribution in Peru. As a result, the impact of minimum wage on the formal sector earnings was only significant on the group of workers which earns a wage between the old and new minimum wage level. On the other hand, similar to Maloney and Nunez (2001), the effect of a change in minimum wage on earnings in the informal sector was only significant at the bottom of distribution and not significant on the distribution above. In addition, a negative employment effect was also found for the group of formal sector workers which earns a wage between the old and new minimum wage level. Compared to Maloney and Nunez (2001), Baanante (2004) confirmed that there was no evidence either for minimum wage effects throughout the distribution (because of spillover effects) or for strong effects in the informal sector (because of lighthouse effects) using Peruvian data. According to Gindling and Terrell (2005), the lighthouse effect is a term used to describe the effects of minimum wage on the sectors or fraction of workers not covered by the minimum wage policy. In this case, although they are not covered by the minimum wage policy (such as informal sector employment), they used the minimum wage level as their reference to set their own wages.

Following the same method constructed by Neumark et al (2004), Fajnzylber (2001) estimated the effects of change in a minimum wage at different points of the wage distribution for both formal and informal salaried workers and for self-employed individuals, using a Brazilian panel data set. In contrast to Baanante (2004), Fajnzylber (2001) found that although the minimum wage policy did not cover both the informal sector and self-employed, the minimum wage effect tended not only to increase the earnings of the workers in the formal (covered) sector throughout the distribution, but also to increase the earnings of the informal (uncovered) salaried workers and self-employed individuals throughout the distribution, indicating a strong lighthouse effect. He also found that the largest impact was at the bottom of the distribution, and it declined monotonically afterwards, except for self-employed individuals. In addition, Fajnzylber (2001) found that an increase in the minimum wage was likely to decrease both formal and informal sector employment. The more interesting finding was that the negative impact was stronger for informal salaried workers and the self-employed. He argued that an increase in minimum wage had induced the informal sector workers to move into the formal sector, which is not normally found in the literature.

Unlike most of the previous studies in developing countries discussed above, it is not possible in my study to create a panel of individuals. Some studies that are relatively close to the present study's methodology are Gindling and Terrell (2005 & 2007). Gindling and Terrell (2005 & 2007) examined the effect of in minimum wage using a pooled cross-sectional time-series data in Costa Rica where the minimum wage is set across industrial and occupational categories. In their first paper, using the log of real minimum wage to measure the minimum wage variable, they tried to test different impacts of changes in the minimum wage on the hourly wage in the covered and uncovered sector across urban and rural areas in Costa Rica. Specifically, they distinguished the labour market into six categories, including four covered sectors (urban formal sector, urban informal small enterprise sector, rural informal large enterprise sector, and rural informal small enterprise sector) and two uncovered sectors (urban self-employed and rural self-employed). As a result, they found that an increase in minimum wage not only affected earnings in the urban formal sector, but also the sector where the minimum wage was not effectively enforced, i.e. the rural informal sectors. In addition, the effect of minimum wage was bigger in the rural informal sector than in the urban formal sector. According to them, the rural informal sector was characterized by more workers near the minimum wage level than in the urban formal sector. In addition, they concluded that an increase in the minimum wage reduced wage differences between the rural informal sector and urban formal sector. Moreover, they found that there was no evidence that an increase in minimum wage reduced the earnings of the self-employed.

In their second paper, Gindling and Terrell (2007) tried to test whether the minimum wage affected wage and employment throughout the distribution, using the predicted wage across the skill level of each worker, separately for the covered and uncovered sectors. In this case, paid employees are categorized as covered sector employment, while self-employed (and unpaid family worker) are defined as uncovered sector employment. Regarding wages, they found that an increase in minimum wage in Costa Rica raised the hourly wage in the covered sector throughout the distribution; and the biggest impact was the hourly wage in the 3rd skill decile with an elasticity of 0.113. On the other hand, in the uncovered sector, there was no evidence of a positive effect of minimum wage on the hourly wage. Relating to the employment equation, they employed a categorical variable as dependent variable where it is equal to 1 if the worker is employed in the covered sectors; otherwise it is equal to 0. Comparing the result from Linear Probability Model (LPM)[37] and the Probit model, they found that an increase in minimum wage of 10% is likely to decrease the probability of being employed in the covered sector by between 0.4% and 1%. The effect was larger at the bottom of the distribution.

Arango and Pachon (2004) extended the analysis by asking how the effect of changes in minimum wage on the probability of being employed and hours worked for household heads, as well as unemployment, participation rate and the hours worked for the non-head members. They employed pooled cross-sectional time-series data of the seven largest cities (which is relatively limited in scope compared to my study of 26 provinces) in Colombia using the ratio of the minimum wage to median income as the minimum wage measure from 1984 to 2001. This measure is a proxy to capture the minimum wage effects, due to the evidence that the single (national) minimum wage exists across individuals in Colombia. In general, their result supported the standard competitive model that an increase in minimum wage was likely to decrease

[37] The Linear Probability Model (LPM) was not much used in the recent literature, due to the limitation that their predicted probability will possibly lay outside the limits of 0 and 1. In addition, the estimate is inefficient because of a potential heteroscedasticity problem. Therefore, most of the econometrics literature does not recommend use of LPM when the dependent variable is binary (see for examples Greene, 2000 and Gujarati, 1999).

the probability of being employed and the number of hours worked for all household members. Specifically, the effect was larger for women, young people and less educated workers.

Although my study's methodology is relatively close to the methods of Gindling and Terrell (2005 & 2007), there are a number of improvements to their methodology as this study's contribution to the developing economies literature. Firstly, using the multinomial logit model makes it possible to observe the more complete effect of the minimum wage on several categories of employment in both the covered and uncovered sectors by the minimum wage, including paid employment, self-employed, unpaid family worker and the unemployed. Compared to my study, Gindling and Terrell (2007) only employed two different categories of employment in their employment equation; i.e. paid employees (covered sector) and uncovered sector, using probit model. Therefore, my study provides a more complete and specific result relating to the effects of changes in minimum wage on several categories of employment in the covered and uncovered sectors.

Secondly, this study treats those effects separately in terms of the labour market in urban and rural areas, as well as in terms of the male and female labour market, which is not considered in Gindling and Terrell (2007). It is generally assumed that the minimum wage policy implementation is less effective in rural areas than in urban areas, given the dominance of the traditional agriculture sector. In addition, male and female workers are treated separately because they have different labour market characteristics. In practice, males are likely to work as either paid employed or self-employed, while in contrast there is a high proportion of females as unpaid family workers because of their domestic responsibilities that require more flexible working hours (see further details in table 6.3).

Table 6.2 Summary of Previous Minimum Wage Studies Using Individual Micro Level Data in Developing Countries

Country/Author	Method	Minimum Wage Measure	Conclusion
Colombia: Maloney & Nunez (2001)	Probit estimates	$\left[\dfrac{mw_t - mw_{t-1}}{mw_{t-1}}\right]$ for each worker's group position in the wage distribution	(1) An increase in the minimum wage **raised** the salaried worker wage throughout the wage distribution. (2) An increase in the minimum wage **raised** the probability of becoming unemployed for the salaried workers throughout the wage distribution.
Peru: Baanante (2004)	Probit estimates	Interactions of dummy variable and the minimum wage level	An increase in the minimum wage was predicted to **decrease** the employment on the group of formal sector worker which earns a wage between the old and new minimum wage level.
Brazil: Fajnzylber (2001)	Regression using individual panel data	$\left[\dfrac{mw_t - mw_{t-1}}{mw_{t-1}}\right]$ for each worker's group position in the wage distribution	(1) An increase in the minimum wage **increased** the earnings in the formal and informal sector throughout the wage distribution. (2) An increase in the minimum wage was likely to **decrease** both formal and informal sector employment.
Costa Rica: Gindling & Terrell (2005)	OLS	Log of real minimum wage	An increase in the minimum wage did not only affect the earnings in the urban formal sector, but also in the rural informal sector.
Costa Rica: Gindling & Terrell (2007)	OLS and Probit estimates	Log of real minimum wage	(1) An increase in the minimum wage **raised** the hourly wage in the covered sector throughout the distribution. (2) An increase in the minimum wage by 10% was predicted to **decrease** the probability of being employed in the covered sector by between 0.4% and 1%.
Colombia: Arango & Pachon (2004)	(1) Binomial model (2) Dynamic panel data model	Ratio of the minimum wage to median income	An increase in the minimum wage **decreased** the probability of being employed and decreased the number of hours worked for all household members.

6.3. Research Methodology

In order to estimate the effects of changes in minimum wage on wages and employment, two different equations (i.e. wage and employment equations) are specified using the pooled cross-sectional time-series data of the Indonesian Labour Force Survey over the period 1996-2003. In general, this study modifies the methodology used by Gindling and Terrell (2005 & 2007) for Costa Rica.

Wage equation:

Relating to the first function, this study estimates the effects of changes in minimum wage on the individual's monthly wage from 1996 to 2003 using OLS. Unlike Gindling and Terrell (2005), this study focuses only on wage rates of paid employees, particularly in the covered sector, since the Indonesian Labour Force Survey does not cover the self-employed earnings data in the uncovered sector (especially before 2002). Specifically, the wage equation used in this study has the following form:

$$lnW_{irt} = \alpha_0 + \alpha_1\, ln\, MW_{rt} + \beta\, X_{itr} + \psi\, UR_{rt} + \gamma_i + v_t + \varepsilon_{it} \qquad (6.1)$$

The dependent variable, W, is the log of the real monthly wage of the individual i, in region r and year t. The monthly wage is used in order to make it comparable with the minimum wage variable which is set based on monthly terms (not hourly terms). As mentioned in the previous chapter, the Indonesian Labour Force Survey (Sakernas) also reports the wage data in the monthly terms (not hourly terms). The main focus of the explanatory variable in the equation is the log of real monthly regional minimum wage, MW, which applies to each individual in the region r and year t. In general, the regional minimum wage used in this study is the provincial minimum wage, except some provinces, particularly Java, which have implemented the more complex municipality and city minimum wages since the decentralization era. Several individual characteristics (X) used as control variables in this study are as follows:

- age and age squared,
- a set of highest education completed (did not finish primary school or were never in school is the reference group),
- a set of sectoral activities of individual job (the agriculture sector is the reference group),
- a set of family background variables, including head of household (not head of household is the reference group) and number of children in the household (no children is the reference group).
- a set of marital status (singles are the reference group).

In addition, the unemployment rate (UR) for each province correlated with the individual in the survey is included as a control variable to indicate the business cycle effect in the labour market. Furthermore, the variables γ_r and v_t are included to control for specific provinces and yearly effects respectively. Following Gindling and Terrell (2007), the yearly dummy variables are useful to control for the potential endogenous changes in the yearly minimum wage which is not covered by the model, such as cyclical macro shocks. Relating to the endogeneity problem, as pointed out by Rama (2001), the main consideration used to set the minimum wage level in each region, i.e. minimum basic living need index (KHM) is mainly exogenous. According to Rama (2001), the consumption packages used to measure the KHM can be traded easily across regions, so we can argue that the minimum wage is exogenous to the regional labour market conditions. In addition, the inclusion of the complete provincial dummy variables will reduce the potential bias from unmeasured province-specific economic conditions.

Extending this wage equation, this chapter estimates the effect of the minimum wage on the wage throughout the distribution. To create that effect, this study adopts the methodology firstly suggested by Koenker and Bassett (1977) using a quantile regression. Unlike OLS where the estimates are obtained by minimising a sum of square residuals, the quantile regression estimates are obtained by minimising a sum of absolute residuals (Koenker and Hallock, 2001). Specifically, as pointed out by Buchinsky (1998) and Birch and Miller (2006), a quantile regression can be specified in general form as follows:

$$y_i = x_i \beta_\theta + e_\theta; \;\; Quant_\theta\,(y_i \mid x_i) = x_i \beta_\theta \qquad (6.2)$$

where $Quant_\theta\,(y_i \mid x_i)$ indicates the conditional quantile of y_i and the conditional on the vector of the explanatory variables (x_i). As pointed out by Buchinsky (1998), the quantile regression estimator (β) is derived from the following minimisation problem:

$$\min\left[\sum_{(i;y_i \geq x_i\beta)} \theta\left|y_i - x_i\beta\right| + \sum_{(i;y_i < x_i\beta)} (1-\theta)\left|y_i - x_i\beta\right|\right] \qquad (6.3)$$

where θth, which is $0<\theta<1$, denotes the sample quantile for β

Compared to the OLS, the quantile regression, firstly, provides a more complete characterization of the regression allowing the entire conditional distribution of a wage equation to be estimated (see Buchincky, 1998, and Koenker and Hallock, 2001). In contrast, the OLS is estimated based on the conditional mean only. Relating to this chapter's objective, the quantile regression allows the minimum wage effect to differ across different points of the wage distribution. This is important because the wage effect at distinct quantiles (percentiles) might be different in response to a change in the minimum wage. In practice, a larger effect should be obtained in the lowest part of the distributions, indicating that the minimum wage is binding for the workers who earn a wage near the minimum wage level. Secondly, as pointed out by Buchinsky (1998), in the case where the error term is not distributed normally, quantile regression might provide more efficient estimates than OLS. Kernel density estimates will be reported in the empirical results section to illustrate the wage distribution among paid employment in both urban and rural areas.

Similar to Machin and Manning (1994), the wage effect is estimated at every tenth percentile on the wage distribution. Specifically, the wage equation using quantile regression in this study will be estimated as follows:

$$lnW_{irt} = \alpha_\theta + \alpha_\theta ln\, MW_{rt} + \beta_\theta X_{itr} + \psi_\theta\, UR_{rt} +_\theta \gamma_i + {}_\theta v_t + \varepsilon_{it} \qquad (6.4)$$

where θ= 0.1, 0.2, ……0.9 is the quantile being estimated (at every tenth percentile on the wage distribution), while the independent variables follow the previous specification.

In addition, similar to Gindling and Terrell (2005), the effects of minimum wage on the individual's monthly wage will be analysed for the urban and rural labour markets separately. This is important because the urban and rural areas have a different range of compliance in the minimum wage policy. Although the minimum wage policy legally covers all of the paid employment in all areas and sectors of employment without exception, the implementation is not actually effective in the rural areas with the dominance of the agriculture sector. In addition, this study also separately analyses male and female workers, due to the fact that males and females have different labour market characteristics.

Employment Equation:

In the second equation, this study examines the effects of changes in minimum wage on employment using a multinomial logit model estimated by a maximum likelihood method. The advantage of this model is that it makes it possible to distinguish the effect of the minimum wage across several categories of employment. Thus we can see how the worker distribution across different employment categories changes as a result of an increase in minimum wage.

Specifically, the labour market, firstly, is divided into three different employment categories (labour market status) based on the minimum wage coverage, represented by j:

$j = 0$: uncovered sector employment;

$j = 1$: covered sector employment;

$j = 2$: unemployed.

Individuals who are out of the labour force, including individuals with their primary activity as a student, a housewife, and those with major activity "other" (unclear category) are excluded from the sample, assuming that they are not willing to work. According to the standard two-sector model, we might expect that an increase in the minimum wage is more likely to decrease the probability of being employed in the covered sector, while those people who lose their jobs will be displaced into the uncovered sector in the absence of unemployment benefits. In general, the uncovered sectors are composed of self-employed and unpaid family workers, while the covered sector employment is paid employment (based on the Indonesian CBS definition). However, as mentioned in the previous chapter, there is an incomplete coverage because of low compliance and lack of enforcement by the government, indicating that not all paid employment is covered by the minimum wage policy. In order to obtain a valid measure of covered sector employment, paid employees who are paid below the minimum wage level in this study will be considered as uncovered sector employment, although all paid employment is actually legally covered by the minimum wage policy. Therefore, in this study, uncovered sector employment includes self-employed, unpaid family workers and paid employment that is paid below the minimum wage level (not covered by the minimum wage policy), while the covered sector employment is defined as paid employment that is paid at or above the minimum wage level (covered by the minimum wage policy) [38].

These categories are still consistent with the standard practice in developing countries studies. Arango and Pachon (2004) defined salaried workers as covered sector employment, while self-employed is categorized as uncovered sector employment for Colombia. Fajnzylber (2001) classified registered workers as covered sector employment, while the uncovered sector is composed of self-employed and unregistered workers for Brazil. On the other hand, Gindling and Terrell (2007)

[38] In general, covered sector employment is also defined as formal sector employment and uncovered sector employment is defined as informal sector employment. (see Gindling and Terrell, 2005). However, the Indonesian government does not clearly define the difference between the formal and informal sectors, particularly for paid employment that is paid below the minimum wage level (paid employment in the uncovered sector). In order to avoid the ambiguity of definition, covered-uncovered sector is used in this chapter instead of formal-informal sector referring to a distinction on the basis of minimum wage coverage.

classified self-employed (plus unpaid family workers) as uncovered sector employment, while paid employees are defined as covered sector employment for Costa Rica. A previous study on the impact of the Indonesian minimum wage on employment in the informal sector has also defined informal (uncovered) sector employment as non-wage employment; including self-employed and unpaid family workers (see Bird and Manning, 2002).

In order to obtain a complete picture of the Indonesian labour force, unemployed is also included as the third category. In line with the ILO standard definition, unemployed is simply defined as people who do not have a job and who are actively looking for a job, including discouraged workers who are still willing to work.

To obtain a more specific result of the labour displacement effect of minimum wage, as an alternative, this study estimates the employment equation using four different employment categories on the basis of labour market statuses:

$j = 0$: self-employed;

$j = 1$: unpaid family worker;

$j = 2$: paid employment;

$j = 3$: unemployed.

According to the Indonesian Central Bureau of Statistics definition, self-employed is defined as own-account workers employed in their own enterprises with or without assistance from their household members/temporary workers, while unpaid family worker is defined as those people who worked on their family-owned business or farm without any wage for their work. Moreover, as mentioned above, paid employment is the category of employment legally covered by the minimum wage policy. However, the effect of minimum wage on this category of employment should be interpreted carefully due to the fact that there is a high proportion of paid employment that is paid below the minimum wage level (paid employment in the uncovered sector). In this case, we do not separate paid employment in the covered sector from paid employment in the uncovered sector in order to see the full effect of minimum wage on the paid employment category.

In order to observe further about the effects of minimum wage on the probability of being paid employed in the covered and uncovered sectors, following the idea of Moretti and Perloff (2000), the paid employment category will also be sub-classified into two specific categories: (1) paid employment that is paid at or above the minimum wage level (paid employment in the covered sector), and (2) paid employment that is paid below the minimum wage level (paid employment in the uncovered sector). As a result, five different employment categories are specified:

$j = 0$: self-employed;

$j = 1$: unpaid family worker;

$j = 2$: paid employment in the uncovered sector

$j = 3$: paid employment in the covered sector

$j = 4$: unemployed.

Specifically, a general expression for the conditional probabilities of each labour market status categories in the multinomial logit model, for example in the four labour market status model, is as follows:

$$\Pr(Y = j \mid x) = \frac{e^{gj(X)}}{\sum_{k=0}^{3} e^{gk(x)}} \qquad (6.5)$$

where dependent variable, Y, refers to the employment categories, *j*; and x is a set of the independent variables (covariates) as follows:

- log of real provincial minimum wage;
- a set of age group (>=50 years old is the reference group),
- a set of marital status (singles are the reference group),
- a set of highest education completed (not finished primary school yet or never been in school is the reference group),
- a set of provincial dummy variables (West Java is the reference group),
- a set of year dummy variables (1996 is the reference group).

Following the same format as the wage equation, the multinomial logit estimates will be analyzed separately in the urban and rural areas labour markets, as well as the male and female labour markets. In order to interpret the analysis, this study reports the marginal effects of each coefficient due to the fact that the interpretation of the raw regression is not directly informative and not comparable within different categories. Relating to the employment equation used in this study, the marginal effects provide information of the change in probabilities of each selected employment categories (compared to the base category). Therefore, specifically, an increase in minimum wage (and also the change in the other covariates) might increase the probability of one selected employment category and might decrease the probability of the other selected employment categories, providing a zero value of total probabilities across all selected categories.

In order to check the robustness of the selected employment categories used in the multinomial logit model, firstly, the Wald test for pooling states over the multinomial logit estimate will be reported (see Long and Freese, 2006). This Wald test examines whether the selected employment categories used above are behaviourally different, and therefore cannot be combined (or pooled). If the result rejects combining of the selected employment categories, it would imply that the selected employment categories used above has significantly different slope coefficients, indicating that the selected employment categories are robust. On the other hand, if the result accepts combining of the selected employment categories, therefore the selected categories might be pooled as a single outcome because the covariates across the selected categories are correlated.

Secondly, the Small and Hsiao test will be undertaken to test the Independence of Irrelevant Alternatives (IIA) assumption underlying the multinomial logit estimate. In general, IIA assumes that the selected categories are independent of each other (see Long and Freese, 2006). Therefore, adding one new alternative category or deleting one of the selected categories will not affect the proportion of individuals choosing the categories. If the IIA assumption is rejected, it means that the selected categories are not independent, implying that the multinomial logit estimate is inappropriate. Both the Wald and Small and Hsiao tests results will be discussed in the empirical results section before the analysis.

6.4. Data

The individual level data set used in this study mostly originates from the Indonesian Labour Force Survey (the so-called Sakernas). As mentioned in the previous chapter, this survey provides a rich source of the cross-sectional labour force data conducted annually since 1986 by the Indonesian Statistical Office (BPS), covering about 160,000 respondents (about 0.1% of population) each year. In this study, the effects of changes in minimum wage on the individual's wage and employment will be estimated using a pooled cross-sectional time-series methodology due to the fact that the Indonesian Labour Force Survey data is not an individual panel. In this case, the wage and employment equations estimated in this study use survey data from 1996 to 2003.

In order to assess the impact of changes in minimum wage on employment, the sample consists of individuals (aged>15) who held one of the primary activities as follows: self-employed, unpaid family worker, paid employment and unemployed. Individuals with their primary activity as a student, a housewife (or a house-husband), and those with major activity "other" are excluded from the sample. In addition, discouraged workers who are not willing to work are also excluded from the sample in order to obtain a valid measure of labour force. Table 6.3 presents cross-tabulation of employment classification in our sample across urban-rural locations, as well as across male-female labour markets.

Table 6.3 Employment Status by Gender and Location (Pooled Data 1996-2003)

	Urban Areas			Rural Areas		
	Male	Female	Total	Male	Female	Total
Self-Employed (%)	36.04	30.51	33.98	60.10	33.07	49.34
Unpaid Family Worker (%)	4.1	17.17	8.97	11.03	45.71	24.83
Paid Employment (%)	51.32	40.00	47.1	25.19	15.45	21.31
Unemployed (%) :	8.54	12.31	9.94	3.68	5.78	4.51
Observations (N)	175245	104027	279272	286185	189199	475384

Source: Calculated from Sakernas

As presented in table 6.3, paid employees dominate both male and female urban employment. As pointed out by Irawan et al (2000), a large proportion of paid employment in urban areas (47.1%) indicates that urban areas have more advanced development achieved than rural areas. The highest proportion of paid employment in urban areas is employed in the manufacturing sector, accounting for more than 30% of total paid employment. On the other hand, in rural areas, a large proportion of self-employed and unpaid family worker (49.3% and 24.8% respectively) indicates limited jobs in the modern sector. Most of them (68% of total self-employed and 85% of total unpaid family workers) worked as farmers in the agricultural sector, given the dominance of traditional agriculture and rural activities in rural areas. In addition, when comparing by gender, it is seen that unpaid family workers are dominated by female employment both in urban and rural areas, while self-employed is dominated by male employment particularly in rural areas with the proportion of 60.1%.

Moreover, the minimum wage data are the provincial (or regional) monthly minimum wage level obtained from the Department of Manpower and the BPS publication. The provincial consumer price index (CPI) data used to transform the minimum wage and the average wage variable in real terms was obtained from the BPS publication. In this case, the CPI data of each province is a proxy from CPI of each provincial capital. Although this is not really applicable particularly for rural areas, the CPI of provincial capital is the closest data that is available to measure the price index in those areas. The summary statistics of the individual's characteristics used in this study are presented in table 6.4.

Table 6.4 Sample Means (Pooled Data 1996-2003)

	Urban			Rural		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**
Marital Status:						
Married	0.706	0.570	0.656	0.748	0.705	0.731
Separated	0.022	0.118	0.058	0.029	0.132	0.070
Education:						
Primary	0.249	0.260	0.253	0.426	0.397	0.415
Junior H.S.	0.195	0.161	0.182	0.167	0.115	0.146
Senior H.S.	0.352	0.301	0.333	0.122	0.083	0.107
Academy	0.022	0.025	0.023	0.004	0.003	0.004
University	0.057	0.051	0.054	0.008	0.005	0.007
Age:						
age15-24	0.196	0.260	0.220	0.212	0.214	0.213
age25-34	0.297	0.284	0.292	0.250	0.254	0.252
age35-50	0.343	0.308	0.33	0.326	0.333	0.329
Lreal minimum wage	11.108	11.102	11.107	11.034	11.011	11.030
Real wage *	175,639	145,773	168,774	134,528	125,380	133,005
Lreal wage *	11.888	11.727	11.851	11.673	11.521	11.647
*Sector of Activities:**						
Mining	0.022	0.003	0.018	0.030	0.005	0.026
Industry	0.235	0.311	0.252	0.206	0.313	0.224
Electricity	0.010	0.003	0.009	0.005	0.001	0.004
Construction	0.133	0.020	0.107	0.212	0.032	0.182
Trade	0.129	0.186	0.142	0.052	0.071	0.055
Transportation	0.093	0.022	0.077	0.082	0.009	0.070
Finance	0.028	0.040	0.031	0.009	0.013	0.010
Services	0.311	0.398	0.331	0.230	0.379	0.255

Source: Calculated from Sakernas and BPS publication
Note: * = is only used in the wage equation

6.5. Empirical Results

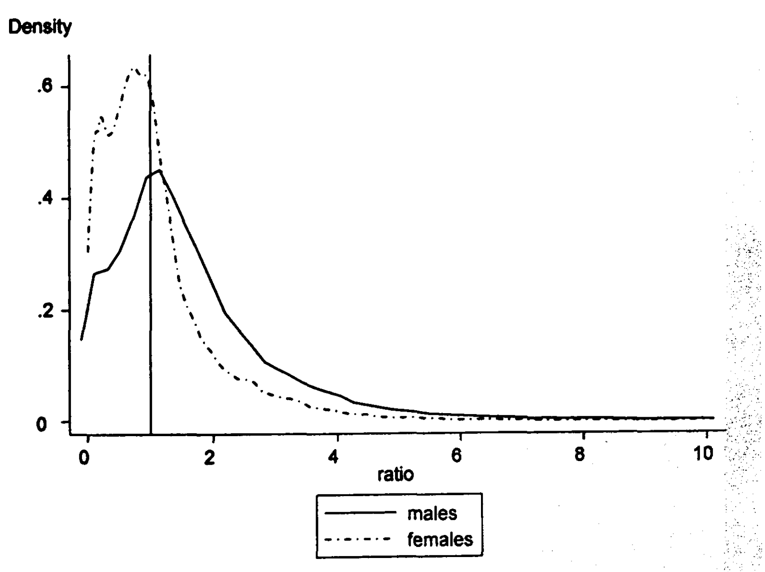
In order to see the full effects of changes in minimum wages, following the same format as Gindling and Terrell (2007), this section firstly discusses the effect of minimum wage on wage before exploring this effect on employment. As pointed out by Burkhauser et al (2000), we should expect that an increase in minimum wage will affect employment only if it has significant effect on the wage rates. In other words, the effect of minimum wage on the wage is a necessary condition for the employment effect of minimum wage.

6.5.1 The Effects of Changes in Minimum Wage on Individual's Monthly Wage

Before discussing the results, it is necessary to see the kernel density estimates for the wage distribution among paid employment in both urban and rural areas. In this case, the shape of wage distribution can be used to assess whether the minimum wage has been effectively enforced in Indonesia. If the minimum wage is effectively enforced, we might expect that there is a spike (a cluster) in the wage distribution which is relatively close to the minimum wage level, indicating that the minimum wage is binding for most workers. On the other hand, if the minimum wage is not effectively enforced, the wage distribution is relatively smooth or the spike is relatively far from the minimum wage level, indicating that the minimum wage is not binding for most workers.

Figure 6.1 presents the kernel density estimate for the impact of minimum wage on wage distribution among paid employment in urban areas using individual pooled data from 1996 to 2003. The y-axis illustrates the density, while the x-axis measures the ratio of real wage to the real minimum wage for each paid employee. The vertical line (ratio equal to 1) therefore indicates how binding the minimum wage level. If the minimum wage is binding, we might expect to see a spike around the vertical line. As presented in figure 6.1, there is a significant spike around the vertical line for both males and females paid employment in urban areas. In comparison, the kernel density estimate suggests that female workers are more affected by the minimum wage (as indicated by the higher density around the vertical line) than male workers. The main reason is because women generally earned less than men. As pointed out by Gindling and Terrell (2005), the larger wage effect is likely to be found in the category of employment with lower average wage. In addition, there is a cluster found below the minimum wage level (on the left side of the vertical line) for female paid employment, suggesting that there is a significant number of female workers still paid below the minimum wage level.

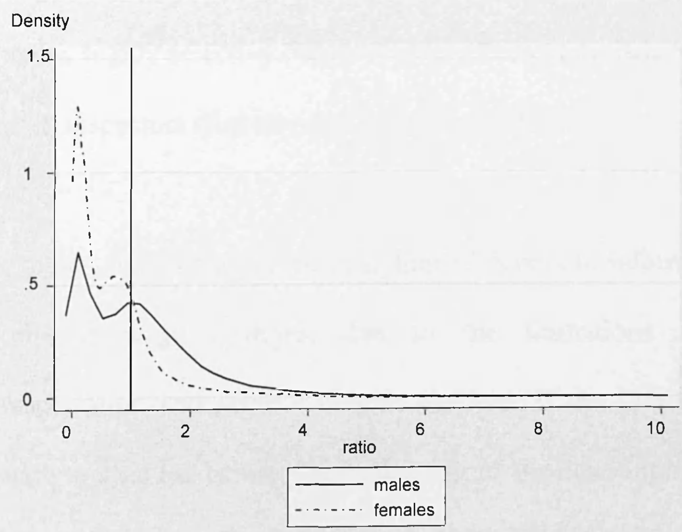
Figure 6.1 The Impact of Minimum Wage on Wage Distribution among Urban Paid Employment (Pooled Data 1996-2003)



Notes: Calculated from Sakernas
The vertical line (ratio equal to 1) represents the minimum wage
An Epanechnicov kernel is used for kernel density with bandwith 0.01.

As pointed out by Firmana (1996), there are at least two reasons why women's wages are generally lower than men's wages in Indonesia. First, women tend to have lower education levels than men, particularly in rural areas. Second, a high percentage of women are employed at lower level of working processes which tend to be low paid, such as farm workers in rural areas and production workers in the textile, garment, and footwear industries in urban areas. However, the wage differences are relatively narrow in the sectors which require more skill and higher levels of education, such as transportation, construction, and financial sectors (Dhanani and Islam, 2004). As pointed out by Dhanani and Islam (2004), in 2000, the female to male earnings ratio of workers in the financial sector was 86%, while it was only 56% in the agriculture sector.

Figure 6.2 The Impact of Minimum Wage on Wage Distribution among Rural Paid Employment (Pooled Data 1996-2003)



Notes: Calculated from Sakernas
The vertical line (ratio equal to 1) represents the minimum wage
An Epanechnicov kernel is used for kernel density with bandwith 0.01.

Turning to rural areas, figure 6.2 indicates that paid employment in rural areas is not greatly affected by the minimum wage. The kernel density estimate reveals that a high proportion of paid employment in rural areas is paid below the minimum wage level (on the left side of the vertical line) for both males and females. In practice, the minimum wage policy is not effectively enforced in rural areas because of the dominance of the traditional agriculture sector.

There are several reasons why the minimum wage policy is not effective in the agriculture sector (and generally in rural areas). Firstly, as pointed out by Suryahadi et al (2003), the enforcement from government is still limited to large and medium enterprises mostly found in urban areas and in non-agriculture activities. Rooney and Anggriani (2006) reported from their survey in Serang District that some small and medium enterprises were unaware about the minimum wage regulation as there was no enforcement from local government. On the other hand, for large enterprises, control from the local government officers for the minimum wage compliance is usually carried out by regular inspection and monitoring every six months, although it remains highly selective (randomly) to some enterprises potentially because of limited labour inspectors (Rooney and Anggriani, 2006).

Secondly, in some areas, there is limited access to information, particularly when the minimum wage changes, due to the limitations of physical infrastructure, transportation and socio-economic welfare. If the information is obtained, there is usually a time lag between the releasing of the new minimum wage and the receiving of the information (Suryahadi et al, 2003). This situation is relatively different with the urban areas, where the information is generally received soon after the publishing of the new minimum wage regulation; and labour unions also actively play an important role in informing the new minimum wage regulation. Thirdly, the level of education of workers in agriculture sector is generally lower than that of non-agriculture workers. Most of the less educated workers might not be aware of the existence of the minimum wage. In practice, it will make compliance more difficult to implement in rural areas.

Turning to the empirical results, the effect of minimum wage on actual wage of paid employment in the covered sector is estimated using pooled cross-sectional time-series data. The dependent variable is the monthly wage paid to each individual worker, while the key explanatory variable is the log of real monthly minimum wage. This study focuses on the wage of covered sector employees because the self-employed (uncovered sector) earnings data is only available from 2002 in the Indonesian Labour Force Survey. Paid employees who are paid below the minimum wage level are also excluded from the sample to obtain suitable results of the minimum wage effects on the wage rates of workers in the covered sector.

Table 6.5 presents a set of results for the wage equation for male and female workers in both urban and rural areas. Most of the control variables in the wage equation are significant as expected. The results generally suggest that the monthly wage will increase as age increases, particularly for younger groups of workers, indicating that an increase in earnings is associated with an increase in working experience. However, this effect declines among the older groups of workers, as showed by the negative effect of age-squared, suggesting an inverted U-shaped (quadratic) relationship. The turning point is found at 53 years old for males in urban and rural areas and at 47 years old for females in rural areas[39].

[39] The turning point is calculated as the age coefficient divided by (2 x age-squared coefficient).

In terms of sector of activity, most of the coefficients are positive and significant (except the trade sector in urban areas). This result means that wages in the agriculture sector (the reference group) are generally lower than non-agricultural sectors of activity. This is not surprising since most workers in the agriculture sector are less skilled and less educated when compared to those in the non-agricultural sector. In other words, individuals employed in the sectors which require more skill and higher levels of education, such as the mining and financial sectors, receive the highest earnings, particularly in urban areas. In urban areas, for example, male workers employed in the mining sector are paid about 43% higher on average than male workers employed in the agriculture sector.

In addition, as expected, educational attainment plays an important role on the individual's wage. As we can see in table 6.5, the wages of individuals with a higher education qualification increase monotonically. In other words, the effect of educational qualifications on the individual's monthly wage is stronger for those with a higher level of education. In urban areas, a university graduate receives 83%-93% higher wage compared to those who did not finish primary school (the reference group), ceteris paribus. In general, the effect is stronger in urban areas, indicating that education is more inferior in rural areas than in urban areas in both quality and quantity aspects at all levels of education. Lanjouw et al (2001) reported that although the quantity of education has improved in Indonesia, particularly because of a rapid growth in schooling opportunities with the nine-year compulsory basic education scheme induced by the government, high disparities among urban-rural areas and across regions remain exist. In Bengkulu and South Sumatra (outside Java), for examples, more than 20% of youths aged 15-17 were not enrolled in school, while in rural Java, less than 10% of youths aged 15-17 were not enrolled in school (Lanjouw et al, 2001).

Table 6.5 Wage Equation in Urban and Rural Areas for Male and Female Workers

	Urban Areas				Rural Areas			
	Male		Female		Male		Female	
Variables	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value
Log real MW	0.3658	0.000	0.4398	0.000	0.4019	0.000	0.4685	0.000
Age	0.0316	0.000	0.0147	0.000	0.0211	0.000	0.0186	0.000
Age squared	-0.0003	0.000	0.0001	0.819	-0.0002	0.000	-0.0002	0.002
Unemployment	0.0508	0.738	-0.5332	0.056	-0.5732	0.003	0.4871	0.374
Married	0.0544	0.000	0.0827	0.000	0.0546	0.000	0.0178	0.327
Separated	-0.0514	0.002	-0.0457	0.003	-0.0493	0.008	-0.0465	0.097
Head of HH	0.0827	0.000	0.0582	0.000	0.0394	0.000	-0.0309	0.202
1 child	-0.0130	0.002	-0.0075	0.316	-0.0022	0.671	-0.0272	0.045
>=2 children	-0.0050	0.291	0.0100	0.262	0.0132	0.019	-0.0209	0.191
Sector								
Mining	0.4324	0.000	0.7771	0.000	0.2137	0.000	0.3706	0.000
Industry	0.0069	0.479	0.3456	0.000	0.0764	0.000	0.2778	0.000
Electricity	0.2436	0.000	0.6723	0.000	0.2654	0.000	0.4180	0.019
Construction	0.0063	0.531	0.4463	0.000	0.1082	0.000	0.4037	0.000
Trade	-0.0504	0.000	0.3097	0.000	0.0437	0.000	0.2574	0.000
Transportation	0.0983	0.000	0.4953	0.000	0.2073	0.000	0.5236	0.000
Finance	0.2261	0.000	0.6132	0.000	0.1681	0.000	0.4610	0.000
Services	0.0770	0.000	0.4672	0.000	0.2531	0.000	0.5179	0.000
Education								
Primary sc.	0.0972	0.000	0.3022	0.000	0.0939	0.000	0.1888	0.000
Junior high sc.	0.2013	0.000	0.4397	0.000	0.1774	0.000	0.2971	0.000
Senior high sc.	0.3922	0.000	0.6073	0.000	0.3302	0.000	0.4686	0.000
Academy	0.7066	0.000	0.8344	0.000	-0.0473	0.004	-0.0180	0.589
University	0.8346	0.000	0.9342	0.000	0.6302	0.000	0.6402	0.000
Year								
1997	0.0634	0.000	0.0529	0.000	0.0293	0.000	0.0167	0.392
1998	-0.1156	0.000	-0.1042	0.000	-0.0894	0.000	-0.0664	0.014
1999	-0.1339	0.000	-0.0723	0.000	-0.1133	0.000	-0.0822	0.009
2000	-0.0150	0.088	0.0146	0.343	0.0073	0.476	0.0587	0.035
2001	0.1027	0.000	0.1528	0.000	0.0645	0.000	0.1629	0.000
2002	0.0674	0.000	0.0835	0.000	0.0647	0.000	0.0779	0.008
2003	0.0501	0.000	0.0852	0.000	0.0388	0.000	0.0762	0.016
Constant	6.5693	0.000	5.4294	0.000	6.4140	0.000	5.2109	0.000
Observations	58929		17591		35203		7029	
R-sq	0.47		0.5		0.419		0.477	

Note: Dependent variable is measured as the log of real individual's monthly wage. All regressions include province dummies. Estimated by Ordinary Least Square.

The coefficient on log of real minimum wage is estimated to be positive and significant for both men and women in urban and rural areas. The most important finding is that the coefficient of the log of real minimum wage for the female labour market is slightly higher than for the male labour market in both urban and rural areas. In urban areas, for example, an increase in minimum wage by 10%, on average, increases females' real monthly wage by 4.4%, while it will only increase males' real monthly wage by 3.7%. This is actually one indication that the minimum wage is more binding for female workers than male workers because women generally tend to be paid less than men.

Moreover, as presented in column 3 and 4 of table 6.5, the effect of minimum wage on monthly wage in rural areas where the minimum wage is not effectively enforced is also positive and significant. The coefficients of real minimum wage in the rural areas are 0.40 for men and 0.47 for women, suggesting that an increase in minimum wage by 10% will lead to an increase in the real monthly wage by 4% for male workers and by 4.7% for female workers respectively, ceteris paribus. It is interesting to note that the coefficients are somewhat higher than the minimum wage coefficient in urban areas because workers in rural areas typically have lower average wage than workers in urban areas. In addition, the significant minimum wage effects in rural areas also suggest the potential for a "lighthouse" effect as exists in Indonesia, where the rural formal sectors possibly set their wages based on the condition of the urban formal sector wages. As pointed out by Rice (2004), there is a tendency that an increase in the income growth in urban formal areas has a greater impact to the people living in rural areas, particularly in the case of Java. A relatively good transportation infrastructure between urban and rural areas makes it possible for people living in rural areas to commute to work in the urban modern sector (Rice, 2004). However, it is not the case outside Java where the transportation infrastructure is relatively weak.

Extending the wage equation, this section examines the effect of minimum wage at different parts of the wage distributions using quantile regression firstly constructed by Koenker and Bassett (1977). The important aim of using quantile regression is to compare the effect of the minimum wage at one part of the wage distribution with another, such as the bottom with the top of the distribution. If the minimum wage policy is effective then we should find a stronger effect at the bottom level of the distribution, indicating that the minimum wage is effective in helping the lowest part of the distribution.

As presented in table 6.6, the effects of minimum wage on individual's monthly wage in the covered sector are positive and significant throughout the distribution across male and female workers, representing the extensive spillover effects. As might be expected, the effect of minimum wage is strongest at the bottom of the distribution and declines monotonically afterwards, except for female employment at the upper levels of the distribution. In urban areas, an increase in the minimum wage affects the monthly wage at the 1st decile (0.693 for males and 0.802 for females) almost three times more than at the 9th decile (0.267 for males and 0.369 for females). As pointed out by Machin and Manning (1994), if the effect is strongest at the bottom level of the distribution, there is a tendency for the minimum wage to compress the wage distribution. The interesting finding is that the effects of the minimum wage on the individual's monthly wage in the rural areas (see column 3 and 4 of table 6.6) are also positive and significant throughout the wage distribution, again representing a potential "lighthouse" effect. As described above, this lighthouse effect indicates that the wages in the rural formal sector are based on the condition of the urban formal sector wage. Therefore, although the minimum wage is not effectively enforced in rural areas compared to urban areas, the minimum wage will also potentially have implications for the employment consequences in rural areas. This is actually one of the reasons why it is interesting to compare the effects of minimum wage between urban and rural areas.

Table 6.6 Wage Equation by Deciles in Urban and Rural Areas by Gender

	Urban Areas				Rural Areas			
	Male (1)		Female (2)		Male (3)		Female (4)	
Decile	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value
1	0.693	0.000	0.802	0.000	0.712	0.000	0.760	0.000
2	0.532	0.000	0.690	0.000	0.582	0.000	0.580	0.000
3	0.432	0.000	0.551	0.000	0.470	0.000	0.481	0.000
4	0.366	0.000	0.479	0.000	0.434	0.000	0.413	0.000
5	0.313	0.000	0.447	0.000	0.409	0.000	0.404	0.000
6	0.284	0.000	0.399	0.000	0.349	0.000	0.391	0.000
7	0.276	0.000	0.353	0.000	0.308	0.000	0.399	0.000
8	0.275	0.000	0.360	0.000	0.264	0.000	0.413	0.000
9	0.267	0.000	0.369	0.000	0.233	0.000	0.474	0.000

Note: Dependent variable is measured as the log of real individual's monthly wage. All regressions include the independent variables described in wage equation.
Estimated by Quantile Regression.

In general, the effect of minimum wage on the female wage is stronger throughout the distribution than on the male wage. This is actually one indication that female employment is more affected by an increase in the minimum wage, suggesting that minimum wage might potentially lead to a larger displacement effect from covered sector to uncovered sector for women. Moreover, the effects of minimum wage on wage rates in rural areas are somewhat higher than in urban areas in some deciles. One potential reason is that workers in rural areas generally earn less than workers in urban areas.

Compared with studies of other developing countries using individual micro-level data sets, the findings are relatively close to those for Brazil and Costa Rica. Fajnzylber (2001) found that there are positive effects of the minimum wage on the wage across the whole of distributions, indicating an extensive "spillover" effect in Brazil. The effect is not only to increase the earnings of workers in the formal (covered) sector, but also to increase the earnings of the informal (uncovered) salaried workers and self-employed individuals, where the minimum wage is not legally enforced. Similar to my findings, the effect on the formal salaried worker is greater for women than for men, indicating that the potential displacement effect is stronger for women than for men. However, one difference with my study is that Fajnzylber (2001) did not estimate separately for urban and rural areas. Similarly to Fajnzylber (2001), Lemos (2004d) found that there are positive effects of the minimum wage on the wage throughout the distribution in Brazil using panel data method, both in formal and informal sectors. The effect is stronger at the bottom of the distribution in the formal sector, but at a higher level of the distribution in the informal sector.

On the other hand, Gindling and Terrell (2005) estimated the minimum wage effect on the wage rates separately for urban and rural areas. They found that an increase in minimum wage in Costa Rica is likely to increase the wages of workers, both in the urban and rural formal sectors. In this case, they argued that the largest impact is found in the rural informal small enterprise sector, where more workers earn a wage near the minimum wage level. Unlike Costa Rica, as mentioned above, the Indonesian minimum wage in practice is not effectively enforced in rural areas.

In summary, the full results relating to the effect of the minimum wage on the individual's monthly wage suggest that the minimum wage increases the wage of individuals throughout the wage distributions in both urban and rural areas. As a result, it is suggested that an increase in minimum wage by 10% will increase individual's monthly wage by 2.67%-8.02% in urban areas and by 2.33%-7.6% in rural areas throughout the distribution. This study reveals that the strongest effect is found for the individuals at the bottom of the distribution, indicating that the minimum wage has improved the standard of living of the workers at the bottom of the distribution. Because we have found that there are strong wage effects of the minimum wage, particularly at the bottom level of the distribution, there remains a concern that the minimum wage potentially affects the employment levels of workers in the covered sector.

However, it is important to note that this estimate only focuses on the wages of paid employees who are paid at or above the minimum wage level (covered sector employment). Using all paid employment data (including paid employment in the uncovered sector), the previous chapter found that the effect of minimum wage on the wage is not strongest at the bottom of the wage distribution, suggesting that the minimum wage is not effective in helping workers in the lowest part of the distribution, particularly for paid employment in the uncovered sector.

6.5.2. The Effect of Minimum Wage on Employment

The effect of minimum wages on employment using the multinomial logit estimate is discussed in this section. This study firstly examines the effect of the minimum wage on three main categories of employment based on the minimum wage coverage: (1) uncovered sector employment, (2) covered sector employment, and (3) unemployed. As an alternative, the employment equation will also be estimated across different categories of employment based on the employment status: (1) self-employed, (2) unpaid family worker, (3) paid employment, and (4) unemployed. Similarly to the wage equation, those effects will be estimated separately in urban and rural labour markets, as well as male and female labour markets.

6.5.2.1. Three Categories of Labour Market Status

Diagnostic Tests

Firstly, the effect of the minimum wage on employment is estimated across three different employment (labour market status) categories based on the minimum wage coverage, including: (1) uncovered sector employment, (2) covered sector employment, and (3) unemployed. Before discussing the results, it is necessary to check the robustness of the selected employment categories used in this multinomial logit estimate using diagnostic tests. The Wald test results for pooling states over the multinomial logit estimate are presented in table 6.7. The results are reported separately across different combinations of employment categories for male and female workers in urban and rural areas. As presented in table 6.7, using all combinations of employment categories, we can reject the null hypothesis that the selected employment categories can be combined (or pooled). These results imply that the selected employment categories used in this section are behaviourally different.

Therefore, we can conclude that the multinomial logit estimate across three different categories used in this study is robust.

Table 6.7 Wald Tests for Pooling Employment Categories

Categories Tested	Urban Areas		Rural Areas	
	Male	Female	Male	Female
Covered Sector & Uncovered Sector	10648.83 (0.00)	10551.44 (0.00)	14919.93 (0.00)	9135.76 (0.00)
Covered Sector & Unemployed	11748.23 (0.00)	9412.33 (0.00)	12931.24 (0.00)	14925.67 (0.00)
Uncovered Sector & Unemployed	10608.47 (0.00)	4081.07 (0.00)	9576.75 (0.00)	4006.87 (0.00)

Notes: Chi-squared test at 45 degree of freedom, p-value in parentheses.
H_0: All coefficients except intercepts associated with a given pair of categories are 0 (categories can be combined).

In addition, the multinomial logit estimate assumes the Independence of Irrelevant Alternatives (IIA) between the selected categories (Long and Freese, 2006). As mentioned before, IIA implies that the proportion of individuals choosing the selected categories will not change when one alternative category is omitted (or added). The Small-Hsiao tests for the Independence of Irrelevant Alternatives over the multinomial logit estimate using three different employment categories are reported in table 6.8. As presented in table 6.8, in all cases, we can accept the null hypothesis suggesting that the IIA assumption holds. By implication, the selected categories used in this section are independent of each other.

Table 6.8 Small-Hsiao Tests for the Independence of Irrelevant Alternatives

Categories Omitted	Urban Areas		Rural Areas	
	Male	Female	Male	Female
Uncovered Sector	-702.71 (1.00)	29.968 (0.97)	-269.623 (1.00)	-108.467 (1.00)
Covered Sector	-1.4e+03 (1.00)	-79.409 (1.00)	-2.0e+03 (1.00)	-985.89 (1.00)
Uncovered Sector	-309.09 (1.00)	-1.2e+03 (1.00)	-3.4e+03 (1.00)	-2.2e+03 (1.00)

Notes: Chi-squared test at 46 degree of freedom, p-value in parentheses.
H_0: Odds (Outcome-J vs Outcome-K) do not depend on other alternatives

Urban Areas

Tables 6.9 and 6.10 present the results for males and females separately. As presented in tables 6.9 and 6.10, most of the covariates have significant marginal effects. Comparing ages, youth employment (age 15-24) has the greatest risk of being unemployed relative to older workers. The reason is that youth employment is composed of young people who enter the labour market for the first time without any job experience. Another reason is that youth ages are the transition period from full-time education to full-time work, suggesting slightly longer duration of job search (Dhanani, 2004). Interestingly, the marginal effect for male youths is relatively lower than the marginal effect for female youths due to the fact that male youths are more likely to be absorbed in covered sector employment rather than to become unemployed. Moreover, in the covered sector, the marginal effects of all the age groups are positive and significant compared to the reference group (age>50). This result means that younger workers (age=<50) are more likely to work in the covered sector, while older workers (age>50) are more likely to have a job in the uncovered sector.

In terms of education, there is a significant ranking of workers' educational attainment, particularly in the covered sector. This result means that those people with a higher education qualification are more likely than those with lower educational qualifications, to be employed in the covered sector. This effect is reflected by an increase in marginal effect, for female workers, from 0.070 for primary school graduates to 0.390 for university graduates, while for men, the marginal effect increases from 0.093 for primary school graduates to 0.336 for university graduates relative to the reference group. In contrast, those people with lower educational qualifications are more likely to be employed in the uncovered sector.

Table 6.9 Employment Equation in Urban Areas, Males (3 employment categories)

	Uncovered Sector		Covered Sector		Unemployed	
	M.E.	P value	M.E.	P value	M.E.	P value
Lrealmw	0.1540	0.000	-0.1408	0.000	-0.0132	0.026
Married	0.0424	0.000	0.0277	0.000	-0.0700	0.000
Separated	0.0823	0.000	-0.0501	0.000	-0.0321	0.000
Primary	-0.0863	0.000	0.0938	0.000	-0.0076	0.041
Junior H.S.	-0.1729	0.000	0.1707	0.000	0.0022	0.561
Senior H.S.	-0.3060	0.000	0.2660	0.000	0.0400	0.000
Academy	-0.3595	0.000	0.3389	0.000	0.0206	0.001
University	-0.3759	0.000	0.3390	0.000	0.0369	0.000
age15-24	-0.1161	0.000	0.0844	0.000	0.0317	0.000
age25-34	-0.1111	0.000	0.1236	0.000	-0.0125	0.002
age35-50	-0.0898	0.000	0.1152	0.000	-0.0254	0.000
Head of HH	0.0247	0.000	0.0619	0.000	-0.0866	0.000
1 child	-0.0031	0.346	0.0082	0.012	-0.0051	0.005
>=2 children	0.0115	0.002	-0.0054	0.139	-0.0061	0.004
year97	-0.0033	0.473	0.0066	0.140	-0.0034	0.186
year98	0.0596	0.000	-0.0728	0.000	0.0132	0.000
year99	0.0590	0.000	-0.0860	0.000	0.0270	0.000
year2000	0.0216	0.000	-0.0452	0.000	0.0236	0.000
year2001	-0.0320	0.000	0.0205	0.000	0.0114	0.000
year2002	-0.0277	0.000	0.0025	0.567	0.0252	0.000
year2003	-0.0257	0.000	0.0005	0.902	0.0251	0.000

Note: All regressions include province dummies. Estimated by Multinomial Logit.
Number of obs = 175245
Wald chi2(84) = 22434.11
Prob > chi2 = 0
Pseudo R2 = 0.1389

The most interesting finding in relation to educational attainment is that there is greater probability of being unemployed for both senior high school and university graduates (for women, marginal effects are 0.049 and 0.044, while for men, marginal effects are 0.040 and 0.037) relative to lower educational qualifications. These results support Feridhanusetyawan and Gaduh's (2000) analysis that without social benefits, only people who have higher family income (usually with a high educational level) might remain unemployed in search of better-paid jobs. On the other hand, people who have lower family income (usually with a lower education level) could not afford to be unemployed for a long time and try to find another job in the uncovered sector.

Table 6.10 Employment Equation in Urban Areas, Females (3 employment categories)

	Uncovered Sector		Covered Sector		Unemployed	
	M.E.	P value	M.E.	P value	M.E.	P value
Lrealmw	0.1495	0.000	-0.1366	0.000	-0.0129	0.166
Married	0.1271	0.000	-0.0273	0.000	-0.0998	0.000
Separated	0.0526	0.000	-0.0471	0.000	-0.0055	0.369
Primary	-0.0569	0.000	0.0699	0.000	-0.0131	0.019
Junior H.S.	-0.1488	0.000	0.1523	0.000	-0.0035	0.543
Senior H.S.	-0.3143	0.000	0.2650	0.000	0.0493	0.000
Academy	-0.4270	0.000	0.4303	0.000	-0.0033	0.649
University	-0.4341	0.000	0.3899	0.000	0.0443	0.000
age15-24	-0.2571	0.000	0.0546	0.000	0.2025	0.000
age25-34	-0.1703	0.000	0.0527	0.000	0.1176	0.000
age35-50	-0.0720	0.000	0.0495	0.000	0.0225	0.012
Head of HH	0.0006	0.931	0.0755	0.000	-0.0761	0.000
1 child	0.0182	0.000	-0.0182	0.000	-0.0001	0.982
>=2 children	0.0349	0.000	-0.0333	0.000	-0.0016	0.628
year97	-0.0234	0.000	0.0290	0.000	-0.0056	0.146
year98	0.0163	0.014	-0.0225	0.000	0.0062	0.240
year99	0.0127	0.070	-0.0434	0.000	0.0307	0.000
year2000	-0.0246	0.000	-0.0036	0.557	0.0282	0.000
year2001	-0.0743	0.000	0.0466	0.000	0.0277	0.000
year2002	-0.0807	0.000	0.0363	0.000	0.0444	0.000
year2003	-0.0971	0.000	0.0491	0.000	0.0480	0.000

Note: All regressions include province dummies. Estimated by Multinomial Logit.
Number of obs = 104027
Wald chi2(86) = 17817.83
Prob > chi2 = 0
Pseudo R2 = 0.204

Regarding family characteristics, heads of household are most likely to work in the covered sector (marginal effects are 0.062 for males and 0.076 for females). In contrast, they are least likely to be unemployed (marginal effects are -0.087 for males and -0.076 for females). Males with children in their households are more likely to work either in the covered or uncovered sectors, suggesting that they are less likely to remain unemployed. On the other hand, females with children are more likely to work in the uncovered sector and less likely to work in the covered sector. The potential reason is because of their commitment to their household responsibilities that requires more flexible working hours.

As presented in tables 6.9 and 6.10, in general we can see that an increase in minimum wage reduces the probability of being employed in the covered sector and increases the probability of being employed in the uncovered sector. Specifically, the coefficient of log of real minimum wage for male workers in the covered sector is negative with a marginal effect of -0.141 (see table 6.9), suggesting that an increase in minimum wage leads to a decline in the probability of men being employed in the covered sector. On the other hand, the coefficient of log of real minimum wage in the uncovered sector is positive with a marginal effect of 0.154, indicating that there is a potential displacement effect from the covered sector to the uncovered sector as the minimum wage increases. Similar to males, an increase in minimum wage decreases the probability of women being employed in the covered sector (marginal effect is -0.137) and increases the probability of women being employed in the uncovered sector (marginal effect is 0.150).

Interestingly, the log of real minimum wage is negatively associated with the probability of men being unemployed. This result shows that an increase in minimum wage reduces the probability of men being unemployed with a marginal effect of -0.013. Although the marginal effect is relatively small (-0.013), the result indicates that an increase in minimum wage has induced individuals who are unemployed (including discouraged workers) to work, particularly in the uncovered sector, for an additional family income because of some job losses in the covered sector. In contrast, the impact of minimum wage on the probability of women being unemployed is not significant. The full results suggest that without unemployment benefits, workers affected by an increase in minimum wage are less likely to remain unemployed, while others are more likely to find a job in the uncovered informal sectors (as self-employed or unpaid family workers).

Rural Areas

In order to provide a more complete picture of the Indonesian labour market, this section discusses the effect of minimum wage on employment in rural areas. Based on the Minister of Manpower Regulation No. 01/1999, the minimum wage legally covers all paid employment without exception, including workers employed in rural areas. However, in practice, the minimum wage implementation is not really effective in rural areas due to the dominance of the traditional agriculture sector. This evidence is revealed by a high proportion of workers in rural areas who earn a wage below the minimum wage level (see figure 6.2 above).

The high percentage of workers who earn a wage below the minimum wage level suggests that workers in rural areas are not greatly affected by the minimum wage policy. This condition is in line with Moretti and Perloff's (2000) study on the effect of the minimum wage on agriculture sector employment in the United States. As pointed out by Moretti and Perloff (2000), although the agriculture sector is legally covered by the Federal minimum wage, compliance is relatively low because of lack of enforcement by the government. Compared to urban areas, therefore, we might expect to find a smaller employment effect (or even no employment effect), given that the minimum wage is less binding to workers employed in rural areas. In contrast, Gindling and Terrell (2005) found that the largest minimum wage impact in Costa Rica is found in the rural informal small enterprise sector because more workers earn a wage near the minimum wage level, indicating that minimum wage is more binding for them. Unlike Indonesia, Gindling and Terrell (2005) argued that the Costa Rican minimum wage is effectively enforced in both urban and rural areas.

Table 6.11 Employment Equation in Rural Areas, Males (3 employment categories)

	Uncovered Sector		Covered Sector		Unemployment	
	M.E.	P value	M.E.	P value	M.E.	P value
Lrealmw	0.0902	0.000	-0.0793	0.000	-0.0109	0.000
Married	0.0186	0.000	0.0170	0.000	-0.0356	0.000
Separated	0.0246	0.000	-0.0125	0.029	-0.0121	0.000
Primary	-0.0402	0.000	0.0424	0.000	-0.0022	0.103
Junior H.S.	-0.1056	0.000	0.0950	0.000	0.0106	0.000
Senior H.S.	-0.2421	0.000	0.1971	0.000	0.0450	0.000
Academy	-0.4242	0.000	0.3778	0.000	0.0464	0.000
University	-0.4045	0.000	0.3372	0.000	0.0673	0.000
age15-24	-0.1319	0.000	0.1000	0.000	0.0318	0.000
age25-34	-0.1237	0.000	0.1112	0.000	0.0125	0.000
age35-50	-0.0964	0.000	0.0948	0.000	0.0017	0.561
Head of HH	0.0226	0.000	0.0110	0.000	-0.0336	0.000
1 child	-0.0077	0.000	0.0070	0.000	0.0007	0.390
>= 2 children	-0.0025	0.244	0.0047	0.018	-0.0022	0.030
Year97	-0.0131	0.000	0.0150	0.000	-0.0020	0.135
Year98	0.0210	0.000	-0.0235	0.000	0.0025	0.154
Year99	0.0221	0.000	-0.0349	0.000	0.0127	0.000
Year2000	0.0028	0.406	-0.0230	0.000	0.0202	0.000
Year2001	-0.0271	0.000	0.0090	0.003	0.0181	0.000
Year2002	-0.0328	0.000	0.0077	0.002	0.0251	0.000
Year2003	-0.0233	0.000	-0.0025	0.307	0.0258	0.000

Note: All regressions include province dummies. Estimated by Multinomial Logit.
Number of obs = 286185
Wald chi2(86) = 26929.56
Prob > chi2 = 0
Pseudo R2 = 0.1459

Following a similar format to the previous section, the impact of minimum wage on employment in rural areas is analysed across three different employment (labour market status) categories based on the minimum wage coverage. The results are presented in tables 6.11 and 6.12 for males and females separately. The covariates show a relatively similar direction to the urban area's findings. In terms of education, a higher education level leads to an increase in the probability of being employed in the rural covered sector. Similar to urban areas, the marginal effects for university and academy graduates are much higher, relative to the lowest education qualifications. Relating to the age groups, younger workers (age=<50) are more likely to work in the covered sectors. The marginal effects are relatively smaller for female workers. Heads of household are more likely to work in either covered or uncovered sectors, but they are less likely to be unemployed. Males with children in their household are more likely to work in the covered sector, while in contrast females with children in their household are less likely to work in the covered sector.

For males, an increase in minimum wage leads to a decrease in the probability of being employed in the covered sector (marginal effect is -0.08), an increase in the probability of being employed in the uncovered sector (marginal effect is 0.09), and a decrease in the probability of being unemployed (marginal effect is -0.01). Compared to urban areas, the marginal effects are much smaller, indicating that the minimum wage is less binding in rural areas than predicted. These results confirm that workers in rural areas are less affected by the minimum wage policy.

In contrast, an increase in minimum wage decreases the probability of women being employed in the covered sector (marginal effect is -0.04) and increases the probability of women being employed in the uncovered sector (marginal effect is 0.04). The marginal effects for female workers are smaller than those for male workers indicating that the minimum wage is less likely to affect female workers in rural areas. In practice, most rural female workers are employed in the agriculture sector, where generally the minimum wage is not binding for them. According to Dhanani and Islam (2004), they are generally assigned in simple weeding and harvesting operations in the agriculture sector with tasks demanding less skill and which tend to be low paid. The incidence of poverty, actually, is the main reason for females in rural areas participating in the labour force, although with relatively low earnings, indicating the need for an additional family income.

Table 6.12 Employment Equation in Rural Areas, Females (3 employment categories)

	Uncovered Sector		Covered Sector		Unemployment	
	M.E.	P value	M.E.	P value	M.E.	P value
Lrealmw	0.0442	0.000	-0.0423	0.000	-0.0019	0.682
Married	0.0994	0.000	-0.0193	0.000	-0.0801	0.000
Separated	0.0202	0.000	-0.0083	0.002	-0.0119	0.000
Primary	-0.0203	0.000	0.0152	0.000	0.0051	0.005
Junior H.S.	-0.0740	0.000	0.0498	0.000	0.0242	0.000
Senior H.S.	-0.2329	0.000	0.1579	0.000	0.0750	0.000
Academy	-0.4327	0.000	0.3888	0.000	0.0439	0.000
University	-0.3900	0.000	0.2959	0.000	0.0941	0.000
age15-24	-0.1312	0.000	0.0244	0.000	0.1068	0.000
age25-34	-0.0758	0.000	0.0165	0.000	0.0593	0.000
age35-50	-0.0398	0.000	0.0221	0.000	0.0176	0.000
Head of HH	0.0188	0.000	0.0215	0.000	-0.0403	0.000
1 child	0.0029	0.080	-0.0014	0.272	-0.0016	0.221
>=2 children	0.0043	0.024	-0.0038	0.008	-0.0006	0.708
Year97	-0.0095	0.000	0.0115	0.000	-0.0020	0.311
Year98	0.0002	0.940	-0.0029	0.216	0.0026	0.312
Year99	-0.0256	0.000	-0.0037	0.120	0.0293	0.000
Year2000	-0.0294	0.000	0.0033	0.181	0.0262	0.000
Year2001	-0.0628	0.000	0.0253	0.000	0.0375	0.000
Year2002	-0.0624	0.000	0.0207	0.000	0.0417	0.000
Year2003	-0.0620	0.000	0.0159	0.000	0.0461	0.000

Note: All regressions include province dummies. Estimated by Multinomial Logit.
Number of obs = 189199
Wald chi2(86) = 21780.6
Prob > chi2 = 0
Pseudo R2 = 0.231

6.5.2.2 Four Categories of Labour Market Status

In this section, extending the analysis, the labour market is distinguished into four different categories of employment based on their employment status: (1) self employed, (2) unpaid family worker, (3) paid employment and (4) unemployed. As pointed out by Sukatrilaksana (2002), the minimum wage coverage in Indonesia refers to a difference based on their status of employment. Compared to the previous specification using three categories of employment, self-employed and unpaid family workers are categorised as uncovered sector employment, while paid employment is the category of employment legally covered by the minimum wage policy (covered sector employment). Although in practice it is possible to have paid employment in the uncovered sector (i.e. paid below the minimum wage level), in this section, we do not separate paid employment in the covered sector (paid at or above the minimum wage level) from paid employment in the uncovered sector (paid below the minimum wage level) in order to see the full effect of minimum wage on the paid employment category. In order to obtain more specific results, as an additional point, paid employment will also be sub-divided in the next section into two specific categories relating to minimum wage coverage: i.e. paid employment in the covered sector and paid employment in the uncovered sector.

Diagnostic Tests

Before discussing the results, following the same format as the previous section, the Wald test for pooling states over the multinomial logit estimate and the Small-Hsiao test for the Independence of Irrelevant Alternatives (IIA) assumption are reported in this section. Firstly, the Wald test results obtained using four employment categories are presented in table 6.13. Using four different employment categories, the chi-square statistics tend to be lower than the previous section using three employment categories. However, all combinations significantly reject pooling of any of the selected employment categories, implying that the selected employment categories used in this section are behaviourally different.

Table 6.13 Wald Tests for Pooling Employment Categories

Categories Tested	Urban Areas		Rural Areas	
	Male	Female	Male	Female
Self-Employed & Unpaid Family Worker	8255.84 (0.00)	3341.85 (0.00)	33294.51 (0.00)	11127.41 (0.00)
Self-Employed & Paid Employment	13574.16 (0.00)	11176.83 (0.00)	25297.73 (0.00)	12317.07 (0.00)
Self-Employed & Unemployed	14978.83 (0.00)	11733.73 (0.00)	18015.22 (0.00)	16188.34 (0.00)
Unpaid Family Worker & Paid Employment	6069.78 (0.00)	6663.6 (0.00)	21452.28 (0.00)	17166.13 (0.00)
Unpaid Family Worker & Unemployed	2122.98 (0.00)	7576.35 (0.00)	5879.28 (0.00)	14429.59 (0.00)
Paid Employed & Unemployed	10021.07 (0.00)	4491.71 (0.00)	9582.39 (0.00)	7447.77 (0.00)

Notes: Chi-squared test at 45 degree of freedom, p-value in parentheses.
H_0: All coefficients except intercepts associated with a given pair of categories are 0 (categories can be combined)

It is important to note that four different employment categories used in this section are based on their status of employment, while three different employment categories used in the previous section are based on the minimum wage coverage (covered or uncovered sectors). Therefore, although the selected combinations in the four different employment categories significantly reject pooling of any of the selected employment categories, it does not mean that the multinomial logit estimate using three different employment categories in the previous section is inappropriate. In other words, three employment categories discussed in the previous section are not an actual pool of four employment categories tested in this section. In three different employment categories, for example, paid employment category can be included in covered sector employment category (if they are paid at or above the minimum wage level) or uncovered sector employment category (if they are paid below the minimum wage level). In addition, this comparison result between three and four employment categories is also useful in order to compare the effects of minimum wage on general and specific specifications of employment.

Moreover, table 6.14 reports the Small-Hsiao tests for the Independence of Irrelevant Alternatives (IIA) assumption between the selected employment categories. As we can see in table 6.14, although the IIA assumption is violated in some cases, particularly for female workers in urban areas, we can accept the null hypothesis in most cases, suggesting that the selected categories used in this section are independent of each other. Therefore, we argue that the multinomial logit estimate using four different categories is robust.

Table 6.14 Small-Hsiao Tests for the Independence of Irrelevant Alternatives

Categories Omitted	Urban Areas		Rural Areas	
	Male	Female	Male	Female
Self-Employed	-708.5 (1.00)	336.201 (0.00)	-406.559 (1.00)	-4.3e+03 (1.00)
Unpaid Family Worker	-1.8e+03 (1.00)	5.035 (1.00)	-5.3e+03 (1.00)	-3.0e+03 (1.00)
Paid Employment	-601.570 (1.00)	526.276 (0.00)	-966.802 (1.00)	-4.6e+03 (1.00)
Unemployed	-126.564 (1.00)	589.207 (0.00)	-4.4e+03 (1.00)	-3.8e+03 (1.00)

Notes: Chi-squared test at 46 degree of freedom, p-value in parentheses.
H_0: Odds (Outcome-J vs Outcome-K) do not depend on other alternatives

Urban Areas

This section discusses the multinomial logit estimate for employment equation in urban areas using four different employment categories based on their employment status. The results for men and women are presented in tables 6.15 and 6.16 below. In terms of education level, in line with the previous section using three different categories of employment, we can see that an improvement in educational attainment leads to an increase in the probability of being paid employed. In this case, the marginal effect for university graduates is 0.31 for both male and female workers, suggesting that the university graduates are 31% more likely to be in paid employment relative to individuals who did not finish primary school or were never in school (the reference group). In contrast, the negative coefficients of educational qualifications for both self-employed and unpaid family worker categories suggest that the less educated workers are more likely to be absorbed in these employment categories as a part of employment in the uncovered sector.

Table 6.15 Employment Equation in Urban Areas, Males (4 employment categories)

	Self-Employed		Unpaid Family Worker		Paid Employment		Unemployed	
	M.E.	P value	M.E.	P value	M.E.	P value	M.E.	P value
Lrealmw	0.0220	0.036	0.0071	0.163	-0.0169	0.139	-0.0122	0.041
Married	0.1049	0.000	-0.0142	0.000	-0.0195	0.001	-0.0712	0.000
Separated	0.1257	0.000	-0.0157	0.000	-0.0788	0.000	-0.0311	0.000
Primary	-0.0463	0.000	-0.0061	0.002	0.0581	0.000	-0.0057	0.135
Junior H.S.	-0.1088	0.000	-0.0061	0.002	0.1086	0.000	0.0063	0.113
Senior H.S.	-0.2532	0.000	-0.0217	0.000	0.2320	0.000	0.0429	0.000
Academy	-0.3098	0.000	-0.0310	0.000	0.3135	0.000	0.0274	0.000
University	-0.3214	0.000	-0.0300	0.000	0.3074	0.000	0.0440	0.000
age15-24	-0.1482	0.000	-0.0244	0.000	0.1405	0.000	0.0321	0.000
age25-34	-0.0770	0.000	-0.0349	0.000	0.1256	0.000	-0.0136	0.001
age35-50	-0.0677	0.000	-0.0298	0.000	0.1238	0.000	-0.0263	0.000
Head of HH	0.1053	0.000	-0.0863	0.000	0.0658	0.000	-0.0847	0.000
1 child	-0.0153	0.000	-0.0002	0.875	0.0206	0.000	-0.0051	0.004
>=2 children	-0.0019	0.577	-0.0020	0.196	0.0100	0.009	-0.0061	0.004
year97	0.0014	0.738	0.0054	0.008	-0.0031	0.502	-0.0037	0.143
year98	0.0247	0.000	0.0125	0.000	-0.0505	0.000	0.0133	0.000
year99	0.0263	0.000	0.0095	0.002	-0.0631	0.000	0.0274	0.000
year2000	0.0348	0.000	0.0122	0.000	-0.0698	0.000	0.0228	0.000
year2001	0.0015	0.772	0.0080	0.002	-0.0199	0.000	0.0104	0.001
year2002	0.0074	0.068	-0.0003	0.895	-0.0318	0.000	0.0246	0.000
year2003	0.0170	0.000	0.0009	0.653	-0.0422	0.000	0.0243	0.000

Note: All regressions include province dummies. Estimated by Multinomial Logit.
Number of obs = 175245
Wald chi2(135) = 31250.78
Prob > chi2 = 0
Pseudo R2 = 0.1776

Classified by age groups, older workers (age >50) are more likely, relative to the other groups, to be self-employed and less likely to be paid employed. On the other hand, younger workers (age=<50) are more likely to be in paid employment. In addition, in line with the previous finding, youths (aged 15-24) are more likely to become unemployed than the other groups with the marginal effects of 0.032 and 0.19 for men and women respectively. As mentioned above, youth employment is dominated by young people who enter the labour market for the first time without any job experience.

Relating to family characteristics, heads of household are more likely to be either self-employed or paid employed because of their responsibilities to gain income for their households. In addition, men with one child in their household are more likely to be paid employed and less likely to be self-employed or unemployed, compared to men without children in their household. In contrast, women with children in their household are more likely to be self-employed and less likely to be paid employed. In line with this evidence, married women are more likely to be either self-employed or unpaid family worker, but less likely to be in paid employment.

As presented in tables 6.15, there is no significant impact of minimum wage on the probability of men being paid employed in urban areas, while in the previous section, using three employment categories, we can see that an increase in minimum wage significantly decreases the probability of men being employed in the urban covered sector. This evidence indicates that, for male workers, there is a shift from the paid employment category in the covered sector to the paid employment category in the uncovered sector as the minimum wage increases. In contrast, as presented in table 6.16, an increase in minimum wage decreases the probability of women being paid employed in urban areas (marginal effect is -0.029), indicating that an increase in the minimum wage is more likely to affect females' paid employment rather than males' paid employment.

Table 6.16 Employment Equation in Urban Areas, Females (4 employment categories)

	Self-Employed		Unpaid Family Worker		Paid Employment		Unemployed	
	M.E.	P value	M.E.	P value	M.E.	P value	M.E.	P value
Lrealmw	-0.0038	0.781	0.0319	0.009	-0.0287	0.048	0.0006	0.947
Married	0.1667	0.000	0.0638	0.000	-0.1285	0.000	-0.1020	0.000
Separated	0.1483	0.000	-0.0728	0.000	-0.0708	0.000	-0.0047	0.431
Primary	0.0123	0.003	0.0025	0.537	-0.0147	0.019	0.0000	0.996
Junior H.S.	-0.0021	0.676	0.0033	0.463	-0.0223	0.001	0.0210	0.001
Senior H.S.	-0.1360	0.000	-0.0822	0.000	0.1490	0.000	0.0691	0.000
Academy	-0.2698	0.000	-0.1538	0.000	0.3789	0.000	0.0448	0.000
University	-0.2655	0.000	-0.1408	0.000	0.3062	0.000	0.1001	0.000
age15-24	-0.2401	0.000	-0.0600	0.000	0.1103	0.000	0.1899	0.000
age25-34	-0.1106	0.000	-0.0723	0.000	0.0795	0.000	0.1035	0.000
age35-50	-0.0460	0.000	-0.0552	0.000	0.0894	0.000	0.0119	0.173
Head of HH	0.2020	0.000	-0.1724	0.000	0.0440	0.000	-0.0736	0.000
1 child	0.0092	0.011	-0.0079	0.013	-0.0011	0.784	-0.0001	0.967
>=2 children	0.0146	0.001	-0.0034	0.360	-0.0091	0.059	-0.0022	0.500
year97	-0.0139	0.004	0.0208	0.000	-0.0011	0.844	-0.0058	0.129
year98	-0.0233	0.000	0.0406	0.000	-0.0270	0.000	0.0097	0.070
year99	-0.0167	0.018	0.0336	0.000	-0.0525	0.000	0.0356	0.000
year2000	-0.0468	0.000	0.0559	0.000	-0.0380	0.000	0.0288	0.000
year2001	-0.0462	0.000	0.0396	0.000	-0.0199	0.003	0.0265	0.000
year2002	-0.0616	0.000	0.0329	0.000	-0.0140	0.012	0.0426	0.000
year2003	-0.0628	0.000	0.0430	0.000	-0.0250	0.000	0.0449	0.000

Note: All regressions include province dummies. Estimated by Multinomial Logit.
Number of obs = 104027
Wald chi2(135) = 21053.08
Prob > chi2 = 0
Pseudo R2 = 0.189

Another important finding is the fact that an increase in the minimum wage raises the probability of being self-employed for men (marginal effect is 0.022). In contrast, women show a different story where an increase in the minimum wage increases the probability of being unpaid family worker (marginal effect is 0.032). This pattern might also reflect limited the self-employment opportunities for female workers, as many occupations in self-employment category are dominated by men, such as street traders or taxi drivers. In addition, as pointed out by Rice (2004), Indonesian law, such as the marriage law, makes it more difficult for women to operate a new business as a self-employee, due to the fact that the new business registration and access to credit and bank loans should be under the husband's name. In contrast, traditionally, the unpaid family workers are mostly dominated by female workers for whom the barriers to entry are relatively low. According to Singh et al (2004), females are more likely to be unpaid family workers, compared to males, because of their home-based locations and flexible working hours related to female domestic tasks.

In addition, the effect of minimum wage on the probability of being unemployed is negative for male workers (marginal effect is -0.012), while it is not significant for female workers. The results are consistent with Gindling and Terrell's (2007) finding that workers who lose their jobs in the covered sector (i.e. paid employment) are less likely to remain unemployed, and more likely to find a job in the uncovered sector.

In general, the finding is relatively consistent with the previous section using three employment categories. In the previous section, the employment categories are distinguished based on the minimum wage coverage, suggesting that an increase in minimum wage decreases the probability of being employed in the covered sector and increases the probability of being employed in the uncovered sector. In this section, the employment categories are distinguished based on their employment status (using four employment categories), showing that an increase in minimum wage reduces the probability of being paid employed, particularly for female workers, and increases the probability of being self-employed and unpaid family worker. As mentioned above, the limitation of multinomial logit estimate using four employment categories used in this section is that we do not separate between paid employment in the covered sector and paid employment in the uncovered sector, while in practice there is a significant amount of paid employment that is paid less than the minimum wage level (paid employment in the uncovered sector).

Table 6.17 Compliance with the Minimum Wage among Paid Employees (%), (Pooled Data 1996-2003)

	Proportion Earning At or Above the Minimum Wage Level	Proportion Earning Below the Minimum Wage Level	Observations (N)
Urban Areas			
Urban Areas – Males	78.54	21.46	85155
Urban Areas – Females	61.21	38.79	40025
Urban Areas – Total	73	27	125180
Rural Areas			
Rural Areas – Males	67.9	32.1	62748
Rural Areas – Females	44.83	55.17	25381
Rural Areas – Total	61.26	38.74	88129

Source : Calculated from Sakernas

As presented in table 6.17, there is a high proportion of paid employees who are paid below the minimum wage level. The proportion is generally higher for female workers, indicating that they are paid less than male workers. Moreover, the proportion of paid employees who are paid less than the minimum wage level is also higher in rural areas, because most are working in the traditional agricultural sector and hence are less affected by the minimum wage regulation. In order to obtain more specific results, as an additional point, paid employment is sub-divided into two more specific categories relating to the minimum wage coverage: (1) paid employment that is paid at or above the minimum wage level (paid employment in the covered sector), and (2) paid employment that is paid below the minimum wage level (paid employment in the uncovered sector).

Moretti and Perloff (2000), using a logit model, found that an increase in the minimum wage raised the probability of being paid less than the minimum wage level in the agriculture sector where the minimum wage coverage is incomplete. Using multinomial logit estimation, my study extends the analysis by estimating the effects of minimum wage on five different employment categories: self-employed, unpaid family worker, unemployed, paid employment in the covered sector, and paid employment in the uncovered sector.

Before discussing the results, we need consider that paid employment in the covered sector and paid employment in the uncovered sector categories potentially have similar slope coefficients because they have similar characteristics. In order to ensure whether the multinomial logit using five employment categories is suitable specification, the Wald test for pooling selected categories is reported in table 6.18. The results suggests we can reject the null hypothesis indicating that paid employment in the covered sector and paid employment in the uncovered sector is behaviourally different. However, as might be predicted, the chi-squared value is relatively lower than the other combinations, although the results remain significant.

Table 6.18 Wald Tests for pooling employment categories

Categories Tested	Urban Areas		Rural Areas	
	Male	Female	Male	Female
PE Covered Sector & PE Uncovered Sector	3234.31 (0.00)	3879.78 (0.00)	2632.64 (0.00)	2156.5 (0.00)
PE Uncovered Sector & Self-Employed	7795.01 (0.00)	7459.14 (0.00)	16192 (0.00)	10025.65 (0.00)
PE Uncovered sector & Unpaid Family W.	4045.69 (0.00)	4484.54 (0.00)	17560.3 (0.00)	14579.05 (0.00)
PE Uncovered Sector & Unemployed	7125.76 (0.00)	4869.67 (0.00)	8525.42 (0.00)	7635.86 (0.00)
PE Covered Sector & Self-Employed	13529.38 (0.00)	12083.6 (0.00)	20792.59 (0.00)	9130.16 (0.00)
PE Covered Sector & Unpaid Family W.	6808.89 (0.00)	8018.68 (0.00)	20078.15 (0.00)	11270.69 (0.00)
PE Covered Sector & Unemployed	10515.86 (0.00)	4064.12 (0.00)	9430.74 (0.00)	4022.27 (0.00)

Notes: PE is Paid Employment

Chi-squared test is employed at 45 degree of freedom, p-value in parentheses.

H_0: All coefficients except intercepts associated with a given pair of categories are 0 (categories can be combined)

Tables 6.19 and 6.20 report the findings for males and females separately across five employment categories in urban areas. Interestingly, there is evidence that the minimum wage decreases the probability of being paid employed in the covered sector and increases the probability of being paid employed in the uncovered sector (paid less than the minimum wage level) for both males and females in urban areas. This evidence is consistent with Moretti and Perloff (2000) finding that an increase in the minimum wage reduced some workers in the sectors where the minimum wage is effectively enforced and induced the affected workers to accept below minimum wage level jobs in the sectors where the minimum wage is not effectively enforced. In practice, there is a case in Indonesia where employers can apply for a temporary waiver if they are not able to comply with the minimum wage policy, indicating that they are not violating the laws by paying their workers below the minimum wage level (Suryahadi et al, 2001). Unfortunately, there is no information in our data set about paid employment that is paid below the minimum wage level because of a temporary waiver. However, I argue that it is less likely due to the fact that the requirements to obtain this waiver tend to be difficult and expensive (see Suryahadi et al, 2001). In addition, Rama (2001) also confirmed that the number of temporary waivers proposed by the companies were not significant.

Table 6.19 Employment Equation in Urban Areas, Males (5 employment categories)

	Self-Employed		Unpaid Family Worker		Paid Employment (>=MW)		Paid Employment (<MW)		Unemployed	
	M.E.	P value	M.E.	P value	M.E.	P value	M.E.	P value	M.E.	P value
Lrealmw	0.0084	0.426	0.0054	0.289	-0.148	0.000	0.1501	0.000	-0.0156	0.009
Married	0.1058	0.000	-0.0140	0.000	0.012	0.039	-0.0324	0.000	-0.0712	0.000
Separated	0.1302	0.000	-0.0156	0.000	-0.075	0.000	-0.0081	0.289	-0.0312	0.000
Primary	-0.0518	0.000	-0.0067	0.001	0.092	0.000	-0.0261	0.000	-0.0078	0.038
Junior H.S.	-0.1152	0.000	-0.0069	0.000	0.166	0.000	-0.0463	0.000	0.0028	0.473
Senior H.S.	-0.2562	0.000	-0.0220	0.000	0.259	0.000	-0.0214	0.000	0.0403	0.000
Academy	-0.3124	0.000	-0.0314	0.000	0.314	0.000	0.0080	0.185	0.0222	0.000
University	-0.3239	0.000	-0.0304	0.000	0.316	0.000	0.0002	0.975	0.0380	0.000
age15-24	-0.1467	0.000	-0.0240	0.000	0.096	0.000	0.0415	0.000	0.0331	0.000
age25-34	-0.0769	0.000	-0.0346	0.000	0.121	0.000	0.0026	0.498	-0.0125	0.002
age35-50	-0.0676	0.000	-0.0296	0.000	0.115	0.000	0.0079	0.026	-0.0255	0.000
Head of HH	0.1067	0.000	-0.0863	0.000	0.067	0.000	-0.0033	0.382	-0.0844	0.000
1 child	-0.0150	0.000	-0.0002	0.883	0.008	0.010	0.0118	0.000	-0.0051	0.005
>=2 children	-0.0019	0.587	-0.0020	0.202	-0.004	0.230	0.0143	0.000	-0.0061	0.005
year97	0.0012	0.777	0.0054	0.008	0.005	0.221	-0.0083	0.010	-0.0038	0.133
year98	0.0180	0.002	0.0116	0.000	-0.076	0.000	0.0351	0.000	0.0116	0.001
year99	0.0185	0.002	0.0085	0.005	-0.090	0.000	0.0374	0.000	0.0252	0.000
year2000	0.0331	0.000	0.0121	0.000	-0.048	0.000	-0.0198	0.000	0.0222	0.000
year2001	0.0019	0.703	0.0081	0.002	0.018	0.001	-0.0388	0.000	0.0105	0.001
year2002	0.0085	0.038	-0.0001	0.957	0.002	0.704	-0.0348	0.000	0.0248	0.000
year2003	0.0185	0.000	0.0010	0.594	-0.001	0.871	-0.0435	0.000	0.0247	0.000

Note: All regressions include province dummies. Estimated by Multinomial Logit.

Number of obs = 175245

Wald chi2(180) = 34286.93

Prob > chi2 = 0

Pseudo R2 = 0.1472

Looking at the control variables, higher education qualifications lead to an increase in the probability of being paid employed in the covered sector. In contrast, paid employment in the uncovered sector is dominated by workers with less educational qualifications. Interestingly, youth employment (age group 15-24 years) is the group of employment that is more likely to be paid less than the minimum wage level. This is one indication that young workers are one of the most vulnerable sectors of employment to be affected by an increase in minimum wage, particularly because of their limited working experience.

Table 6.20 Employment Equation in Urban Areas, Females (5 employment categories)

	Self-Employed		Unpaid Family Worker		Paid Employment (>=MW)		Paid Employment (<MW)		Unemployed	
	M.E.	P value	M.E.	P value	M.E.	P value	M.E.	P value	M.E.	P value
Lrealmw	-0.0205	0.136	0.0206	0.091	-0.1374	0.000	0.1504	0.000	-0.0131	0.161
Married	0.1658	0.000	0.0642	0.000	-0.0337	0.000	-0.0945	0.000	-0.1019	0.000
Separated	0.1468	0.000	-0.0709	0.000	-0.0501	0.000	-0.0199	0.006	-0.0059	0.320
Primary	0.0027	0.515	-0.0047	0.224	0.0702	0.000	-0.0547	0.000	-0.0135	0.016
Junior H.S.	-0.0184	0.000	-0.0083	0.053	0.1468	0.000	-0.1156	0.000	-0.0045	0.438
Senior H.S.	-0.1480	0.000	-0.0893	0.000	0.2622	0.000	-0.0744	0.000	0.0496	0.000
Academy	-0.2764	0.000	-0.1577	0.000	0.4388	0.000	-0.0066	0.385	0.0019	0.805
University	-0.2723	0.000	-0.1463	0.000	0.3964	0.000	-0.0269	0.000	0.0490	0.000
age15-24	-0.2404	0.000	-0.0597	0.000	0.0440	0.000	0.0660	0.000	0.1901	0.000
age25-34	-0.1103	0.000	-0.0722	0.000	0.0429	0.000	0.0360	0.000	0.1036	0.000
age35-50	-0.0464	0.000	-0.0554	0.000	0.0381	0.000	0.0519	0.000	0.0117	0.176
Head of HH	0.1984	0.000	-0.1725	0.000	0.0796	0.000	-0.0332	0.000	-0.0723	0.000
1 child	0.0089	0.014	-0.0083	0.009	-0.0199	0.000	0.0201	0.000	-0.0008	0.768
>=2 children	0.0138	0.001	-0.0040	0.281	-0.0357	0.000	0.0285	0.000	-0.0026	0.414
year97	-0.0152	0.001	0.0199	0.000	0.0268	0.000	-0.0249	0.000	-0.0066	0.085
year98	-0.0288	0.000	0.0361	0.000	-0.0246	0.000	0.0124	0.073	0.0049	0.353
year99	-0.0227	0.001	0.0287	0.000	-0.0453	0.000	0.0099	0.172	0.0293	0.000
year2000	-0.0495	0.000	0.0532	0.000	-0.0071	0.235	-0.0226	0.000	0.0259	0.000
year2001	-0.0482	0.000	0.0378	0.000	0.0423	0.000	-0.0573	0.000	0.0255	0.000
year2002	-0.0620	0.000	0.0324	0.000	0.0333	0.000	-0.0465	0.000	0.0428	0.000
year2003	-0.0633	0.000	0.0425	0.000	0.0450	0.000	-0.0697	0.000	0.0455	0.000

Note: All regressions include province dummies. Estimated by Multinomial Logit.
Number of obs = 104027
Wald chi2(180) = 24155.79
Prob > chi2 = 0
Pseudo R2 = 0.1745

The impact of the minimum wage on the probability of being self-employed is not significant for both males and females using five categories of employment. This result suggests that the affected paid employment from the covered sector is more likely to accept below minimum wage jobs perhaps in the same sector of activities that they have experienced, but less likely to be self-employed. Another reason that people are less likely to be self-employed is because the business failure rate (risk) is usually high, particularly among new self-employees (Rice, 2004). In addition, for females, there is a tendency that an increase in minimum wage raises the probability of being an unpaid family worker, although the marginal effect is relatively small.

In summary, the multinomial logit estimate using four (and five) employment categories showed more complete displacement effects for paid employment from the covered sector to the uncovered sector as minimum wage increases in Indonesia. This study found that a 10% increase in minimum wage reduces the probability of being in paid employment in the covered sector in urban areas by 0.137%-0.148%. On the other hand, an increase in minimum wage increases the probability of being paid employed in the urban uncovered sector by 0.15%. For females, there is evidence that an increase in minimum wage raises the probability of being unpaid family worker by 0.02%. These effects are relatively smaller than Gindling and Terrell (2007) estimate for Costa Rica. Using probit estimates, they found that a 10% increase in minimum wage decreases the probability of being employed in covered sector by 0.47%-0.68%, suggesting that the minimum wage policy is more binding in Costa Rica than Indonesia. However, in line with my study, their result generally indicates that those workers who lose their jobs in the covered sector are more likely to find a job in the uncovered sectors suggested by two-sector model.

Rural Areas

This section discusses the effects of minimum wage on employment in rural areas using four (and five) different categories of employment. Similar to the previous section, this study specifies the selected employment categories as: (1) self-employed, (2) unpaid family worker, (3) paid employment, and (4) unemployed. The results for four different categories of employment are presented in tables 6.21 and 6.22 for males and females separately. For male workers, an increase in minimum wage has a negative effect on the probability of being paid employed in rural areas with a marginal effect of -0.020. In contrast, there is no significant effect for female workers, suggesting that they are less affected by the minimum wage since many of them (more than 50%, see table 6.17) are paid less than the minimum wage level.

Within the uncovered sector, an increase in minimum wage raises the probability of men being self-employed (marginal effect is 0.023). In contrast, for women, an increase in minimum wage reduces the probability of being self-employed (marginal effect is -0.039). This feature suggests that self-employed opportunities for women are limited (see previous discussion). On the other hand, unpaid family worker plays an important role in providing an alternative job for women in rural areas. As presented in table 6.22, an increase in the minimum wage has a positive effect on the probability of being an unpaid family worker with a marginal effect of 0.037. In addition, similar to the previous section using three categories of employment, an increase in the minimum wage decreases the probability of being unemployed for men, although the coefficient is relatively small with a marginal effect of only -0.01.

Table 6.21 Employment Equation in Rural Areas, Males (4 employment categories)

	Self-Employed		Unpaid Family Worker		Paid Employment		Unemployed	
	M.E.	P value	M.E.	P value	M.E.	P value	M.E.	P value
Lrealmw	0.0233	0.003	0.0067	0.217	-0.0202	0.010	-0.0097	0.002
Married	0.1100	0.000	-0.0268	0.000	-0.0452	0.000	-0.0380	0.000
Separated	0.0625	0.000	-0.0120	0.000	-0.0374	0.000	-0.0131	0.000
Primary	-0.0191	0.000	-0.0038	0.023	0.0249	0.000	-0.0020	0.153
Junior H.S.	-0.0696	0.000	-0.0099	0.000	0.0677	0.000	0.0118	0.000
Senior H.S.	-0.2322	0.000	-0.0415	0.000	0.2263	0.000	0.0474	0.000
Academy	-0.5195	0.000	-0.0772	0.000	0.5473	0.000	0.0494	0.000
University	-0.4807	0.000	-0.0736	0.000	0.4828	0.000	0.0715	0.000
age15-24	-0.1902	0.000	-0.0117	0.000	0.1700	0.000	0.0318	0.000
age25-34	-0.1123	0.000	-0.0404	0.000	0.1418	0.000	0.0109	0.000
age35-50	-0.0826	0.000	-0.0439	0.000	0.1241	0.000	0.0025	0.404
Head of HH	0.2771	0.000	-0.2790	0.000	0.0326	0.000	-0.0306	0.000
1 child	-0.0121	0.000	0.0014	0.299	0.0100	0.000	0.0008	0.371
>=2 children	-0.0028	0.239	0.0007	0.622	0.0042	0.076	-0.0022	0.032
year97	-0.0190	0.000	0.0075	0.000	0.0135	0.000	-0.0020	0.127
year98	0.0094	0.015	0.0150	0.000	-0.0269	0.000	0.0025	0.152
year99	0.0109	0.008	0.0092	0.001	-0.0330	0.000	0.0129	0.000
year2000	0.0123	0.001	0.0162	0.000	-0.0482	0.000	0.0197	0.000
year2001	-0.0196	0.000	0.0166	0.000	-0.0145	0.000	0.0175	0.000
year2002	-0.0200	0.000	0.0021	0.294	-0.0070	0.015	0.0249	0.000
year2003	-0.0166	0.000	0.0240	0.000	-0.0322	0.000	0.0249	0.000

Note: All regressions include province dummies. Estimated by Multinomial Logit.

Number of obs = 286185
Wald chi2(138) = 6873.32
Prob > chi2 = 0
Pseudo R2 = 0.2532

Table 6.22 Employment Equation in Rural Areas, Females (4 employment categories)

	Self-Employed		Unpaid Family Worker		Paid Employment		Unemployed	
	M.E.	P value	M.E.	P value	M.E.	P value	M.E.	P value
Lrealmw	-0.0395	0.000	0.0366	0.002	0.0027	0.738	0.0002	0.971
Married	0.0853	0.000	0.0743	0.000	-0.0782	0.000	-0.0814	0.000
Separated	0.1264	0.000	-0.0871	0.000	-0.0264	0.000	-0.0129	0.000
Primary	0.0146	0.000	-0.0107	0.000	-0.0106	0.000	0.0067	0.000
Junior H.S.	0.0447	0.000	-0.0672	0.000	-0.0048	0.143	0.0273	0.000
Senior H.S.	-0.0695	0.000	-0.2353	0.000	0.2195	0.000	0.0853	0.000
Academy	-0.2897	0.000	-0.4272	0.000	0.6498	0.000	0.0670	0.000
University	-0.2582	0.000	-0.3987	0.000	0.5307	0.000	0.1261	0.000
age15-24	-0.1449	0.000	-0.0382	0.000	0.0779	0.000	0.1052	0.000
age25-34	-0.0559	0.000	-0.0646	0.000	0.0637	0.000	0.0568	0.000
age35-50	-0.0164	0.000	-0.0579	0.000	0.0582	0.000	0.0161	0.000
Head of HH	0.4408	0.000	-0.4721	0.000	0.0673	0.000	-0.0360	0.000
1 child	0.0079	0.003	-0.0021	0.457	-0.0040	0.054	-0.0018	0.152
>=2 children	0.0031	0.309	0.0091	0.004	-0.0116	0.000	-0.0007	0.631
year97	-0.0434	0.000	0.0356	0.000	0.0097	0.001	-0.0020	0.299
year98	-0.0505	0.000	0.0501	0.000	-0.0023	0.551	0.0028	0.283
year99	-0.0499	0.000	0.0259	0.000	-0.0058	0.159	0.0297	0.000
year2000	-0.0863	0.000	0.0750	0.000	-0.0138	0.000	0.0251	0.000
year2001	-0.1085	0.000	0.0726	0.000	-0.0003	0.936	0.0363	0.000
year2002	-0.0719	0.000	0.0357	0.000	-0.0047	0.114	0.0409	0.000
year2003	-0.1286	0.000	0.0995	0.000	-0.0152	0.000	0.0442	0.000

Note: All regressions include province dummies. Estimated by Multinomial Logit.
Number of obs = 189199
Wald chi2(138) = 38840.59
Prob > chi2 = 0
Pseudo R2 = 0.1847

Tables 6.23 and 6.24 report the marginal effects for males and females in rural areas across five different employment categories. Similar to urban areas, this study found that an increase in minimum wage decreases the probability of being in paid employment in the covered sector (marginal effects are -0.077 for males and -0.041 for females) and increases the probability of being paid employed in the uncovered sector (marginal effects are 0.052 for males and 0.041 for females). In addition, there is evidence that the minimum wage raises the probability of being self-employed for men (marginal effect is 0.027) and raises the probability of being unpaid family worker for females (marginal effect is 0.038), suggesting that males and females behave differently as the minimum wage increases.

Table 6.23 Employment Equation in Rural Areas, Males (5 employment categories)

	Self-Employed		Unpaid Family Worker		Paid Employment (>=MW)		Paid Employment (<MW)		Unemployed	
	M.E.	P value	M.E.	P value	M.E.	P value	M.E.	P value	M.E.	P value
Lrealmw	0.0271	0.001	0.0075	0.165	-0.0773	0.000	0.0521	0.000	-0.0094	0.002
Married	0.1112	0.000	-0.0267	0.000	-0.0061	0.085	-0.0404	0.000	-0.0380	0.000
Separated	0.0680	0.000	-0.0114	0.001	-0.0360	0.000	-0.0077	0.071	-0.0130	0.000
Primary	-0.0223	0.000	-0.0046	0.006	0.0419	0.000	-0.0125	0.000	-0.0024	0.078
Junior H.S.	-0.0762	0.000	-0.0113	0.000	0.0950	0.000	-0.0184	0.000	0.0108	0.000
Senior H.S.	-0.2390	0.000	-0.0429	0.000	0.1988	0.000	0.0373	0.000	0.0458	0.000
Academy	-0.5212	0.000	-0.0779	0.000	0.3680	0.000	0.1836	0.000	0.0474	0.000
University	-0.4831	0.000	-0.0743	0.000	0.3368	0.000	0.1515	0.000	0.0690	0.000
age15-24	-0.1927	0.000	-0.0118	0.000	0.1111	0.000	0.0617	0.000	0.0317	0.000
age25-34	-0.1151	0.000	-0.0406	0.000	0.1066	0.000	0.0383	0.000	0.0108	0.001
age35-50	-0.0852	0.000	-0.0444	0.000	0.0960	0.000	0.0314	0.000	0.0022	0.451
Head of HH	0.2772	0.000	-0.2793	0.000	0.0156	0.000	0.0171	0.000	-0.0307	0.000
1 child	-0.0120	0.000	0.0014	0.286	0.0075	0.000	0.0024	0.131	0.0008	0.364
>=2 children	-0.0025	0.291	0.0008	0.598	0.0060	0.003	-0.0021	0.238	-0.0022	0.034
year97	-0.0199	0.000	0.0073	0.000	0.0149	0.000	-0.0002	0.932	-0.0021	0.108
year98	0.0094	0.015	0.0151	0.000	-0.0232	0.000	-0.0037	0.196	0.0025	0.155
year99	0.0106	0.009	0.0092	0.001	-0.0346	0.000	0.0019	0.537	0.0129	0.000
year2000	0.0121	0.001	0.0162	0.000	-0.0232	0.000	-0.0247	0.000	0.0196	0.000
year2001	-0.0209	0.000	0.0163	0.000	0.0085	0.005	-0.0213	0.000	0.0174	0.000
year2002	-0.0217	0.000	0.0018	0.371	0.0075	0.002	-0.0122	0.000	0.0246	0.000
year2003	-0.0183	0.000	0.0236	0.000	-0.0035	0.144	-0.0265	0.000	0.0247	0.000

Note: All regressions include province dummies. Estimated by Multinomial Logit.
Number of obs =286185
Wald chi2(180) = 69617.12
Prob > chi2 = 0
Pseudo R2 = 0.2202

Table 6.24 Employment Equation in Rural Areas, Females (5 employment categories)

	Self-Employed		Unpaid Family Worker		Paid Employment (>=MW)		Paid Employment (<MW)		Unemployed	
	M.E.	P value	M.E.	P value	M.E.	P value	M.E.	P value	M.E.	P value
Lrealmw	-0.0380	0.001	0.0382	0.001	-0.0413	0.000	0.0409	0.000	0.0002	0.967
Married	0.0850	0.000	0.0739	0.000	-0.0211	0.000	-0.0565	0.000	-0.0814	0.000
Separated	0.1261	0.000	-0.0871	0.000	-0.0102	0.000	-0.0161	0.000	-0.0128	0.000
Primary	0.0131	0.000	-0.0128	0.000	0.0156	0.000	-0.0209	0.000	0.0051	0.006
Junior H.S.	0.0401	0.000	-0.0718	0.000	0.0482	0.000	-0.0398	0.000	0.0233	0.000
Senior H.S.	-0.0769	0.000	-0.2425	0.000	0.1594	0.000	0.0820	0.000	0.0780	0.000
Academy	-0.2925	0.000	-0.4297	0.000	0.4133	0.000	0.2585	0.000	0.0504	0.000
University	-0.2619	0.000	-0.4021	0.000	0.3229	0.000	0.2333	0.000	0.1079	0.000
age15-24	-0.1451	0.000	-0.0385	0.000	0.0238	0.000	0.0548	0.000	0.1050	0.000
age25-34	-0.0562	0.000	-0.0650	0.000	0.0157	0.000	0.0490	0.000	0.0565	0.000
age35-50	-0.0167	0.000	-0.0585	0.000	0.0210	0.000	0.0384	0.000	0.0157	0.000
Head of HH	0.4396	0.000	-0.4722	0.000	0.0277	0.000	0.0412	0.000	-0.0362	0.000
1 child	0.0079	0.003	-0.0021	0.457	-0.0017	0.168	-0.0023	0.209	-0.0018	0.152
>=2 children	0.0031	0.309	0.0091	0.004	-0.0041	0.004	-0.0074	0.001	-0.0007	0.634
year97	-0.0442	0.000	0.0343	0.000	0.0109	0.000	0.0013	0.599	-0.0024	0.221
year98	-0.0509	0.000	0.0493	0.000	-0.0032	0.158	0.0024	0.509	0.0025	0.339
year99	-0.0501	0.000	0.0253	0.000	-0.0039	0.096	-0.0006	0.869	0.0294	0.000
year2000	-0.0869	0.000	0.0738	0.000	0.0025	0.289	-0.0141	0.000	0.0248	0.000
year2001	-0.1102	0.000	0.0694	0.000	0.0236	0.000	-0.0182	0.000	0.0355	0.000
year2002	-0.0737	0.000	0.0327	0.000	0.0194	0.000	-0.0186	0.000	0.0401	0.000
year2003	-0.1301	0.000	0.0965	0.000	0.0141	0.000	-0.0241	0.000	0.0436	0.000

Note: All regressions include province dummies. Estimated by Multinomial Logit.

Number of obs =189199
Wald chi2(180) = 40970.79
Prob > chi2 = 0
Pseudo R2 = 0.1758

Compared to urban areas, the marginal effect of the minimum wage in rural areas is relatively smaller, suggesting that the minimum wage is more binding in urban areas than in rural areas. In addition, this evidence actually confirmed the existence of a dualistic employment structure in Indonesia between urban and rural areas (Manning, 2003a). As pointed out by Manning (2003a), workers in rural areas are mostly engaged in traditional agricultural activities and hence are less affected by the minimum wage policy because of low compliance in rural areas, while workers in urban areas are mostly employed in the modern sector and most directly affected by the minimum wage policy and any other labour regulation.

6.5.2.3 Youth Employment

As a final point, the effect of minimum wage on youth employment is discussed in this section. This sector of employment is the category that is typically at the bottom of the wage distribution and, therefore, is predicted to be more affected by the minimum wage (Card, 1992b). Following the ILO definition, youth employment is defined as those young people between 15 and 24 years old who actively participate in the labour market. In practice, this age group is the range of ages from the earliest school leaving age (lower secondary level)[40] to the age when most people are expected to complete their tertiary level of education (university degree).

The youth labour force forms around 20 percent of the total labour force in Indonesia, with more than 60 percent of them living in rural areas. Looking at the distribution (table 6.25), most young males and young females in urban areas work as paid employees, while in rural areas, most work in the uncovered sectors, i.e. self-employed and unpaid family worker. Actually, this situation is related to the scarcity of jobs in the rural covered sector, compared to urban areas.

[40] The lower secondary level (junior high school) is the earliest school leaving level in Indonesia. Since the early 2000s, the Indonesian government has induced young people to finish at least lower secondary level by nine years' schooling, although the implementation varies across regions.

Table 6.25 Youth Employment Status by Gender and Location (Pooled Data 1996-2003)

	Urban Areas			Rural Areas		
	Male	Female	Total	Male	Female	Total
1. Self-Employed (%)	15.64	8.64	12.55	24.76	16.74	21.55
2. Unpaid Family Worker (%)	12.47	15.44	13.78	36.10	45.32	39.79
3. Paid Employment (%)	44.76	47.07	45.77	25.88	19.05	23.14
4. Unemployed (%)	27.13	28.86	27.89	13.27	18.88	15.51
Observations (N)	34387	27108	61495	60672	40437	101109

Source: Calculated from Sakernas

According to the school-to-work transition survey in three provinces of Indonesia (ILO, 2003), in practice there are some barriers for young people to finding a job in the labour market. Firstly, according to the survey findings, the main obstacle for the surveyed employers and managers in recruiting young people as their employees is that they have low education and skills. Secondly, most young people lack work experience particularly because they enter the labour market for the first time without any work experience. From the survey finding, only around 40% of young people joined in work experience programmes as part of their educational attainment (ILO, 2003). In addition, the weak linkages between the education system and the labour market make the problem more difficult. As pointed out by the Indonesian Youth Employment Network (2003), there is still a large part of the education curriculum that is unrelated to the needs of the labour market. Thirdly, in the regions that are poor and least modernized, such as East Nusa Tenggara (see Jones et al, 1998), the job opportunities are relatively limited. As a consequence, most educated youths will accept work in the informal sector, move elsewhere in Indonesia or abroad, or will remain unemployed depending on their expected wage (Jones et al, 1998).

In terms of minimum wage, almost 50% of Indonesian young workers are paid below the minimum wage level (see table 6.26). The highest proportion is located in rural areas where the minimum wage is less binding. There are several reasons why young people are paid below the minimum wage level. Firstly, the majority of young employees work in small enterprises[41] (see ILO, 2003) with the proportion between 56% and 79% depending on their region. Most of them work in the small enterprise because of low barriers of entry and limited access to the large and medium enterprises with the higher recruitment standard. Suryahadi et al (2001) pointed out that in general workers in small enterprises, on average, are paid 10% below the minimum wage level. According to Suryahadi et al (2003), the enforcement from the government is often not really effective and is still limited to large and medium enterprises.

Table 6.26 Compliance with the Minimum Wage among Youth Employees (%), (Pooled data 1996-2003)

	Proportion Earning At or Above the Minimum Wage Level	Proportion Earning Below the Minimum Wage Level	Observation (N)
Urban Areas			
Urban Areas – Males	62.3	37.7	15391
Urban Areas – Females	47.34	52.66	12758
Urban Areas – Total	55.52	44.48	28149
Rural Areas			
Rural Areas – Males	52.97	47.03	15700
Rural Areas – Females	33.67	66.33	7704
Rural Areas – Total	46.62	53.38	23404

Source : Calculated from Sakernas

Secondly, the majority of young workers are not registered as members of a labour union. According to Indonesia Youth Employment Network (2003), therefore they often do not have any representation and bargaining position to present their concerns and needs. In practice, in the sector where the labour union is effective, such as the manufacturing sector in urban areas, the labour union has an important role in encouraging the business environment to comply with the minimum wage regulation

[41] Small enterprise is defined as a business with less than ten co-workers.

and in preventing any labour abuses (Agrawal, 1995). Thirdly, in the case of rural areas, their knowledge about the minimum wage policy might be limited due to the fact that most of them have a low level of education. Even though some young workers might understand about the minimum wage policy, they do not object because it seems there is a lack of choice of job opportunities for them and they consider their income to be comparable with their low level of education, limited working experiences and the financial condition of the employer.

To see the effects of changes in the minimum wage on youth employment, the employment equation is re-estimated using the sample of young people between 15 and 24 years old. The independent variables are the same as in the previous section, except different age groups variables will be included as part of the independent variables. Following a similar format to the previous section, the results obtained from the youth employment equation above are reported separately for urban and rural areas, as well as for the male and female youth labour market.

The results of the youth employment equation in urban areas are presented in tables 6.27 and 6.28 using five different employment categories. Looking at the control variables, an increase in age is associated with an increase in the probability of being a paid employee for both males and females. An increase in age means that young people have possibly gained more experiences. Therefore, older workers are more likely to work as paid employed because they have more experience.

Table 6.27 Youth Employment Equation in Urban Areas, Males (5 employment categories)

	Self-Employed		Unpaid Family Worker		Paid Employment (>=MW)		Paid Employment (<MW)		Unemployed	
	M.E.	P value	M.E.	P value	M.E.	P value	M.E.	P value	M.E.	P value
Lrealmw	0.0299	0.126	-0.0161	0.416	-0.1972	0.000	0.2209	0.000	-0.0375	0.099
Married	0.1312	0.000	-0.0281	0.002	0.0420	0.000	-0.0097	0.302	-0.1354	0.000
Primary	-0.0276	0.001	0.0138	0.162	0.0074	0.606	-0.0235	0.012	0.0299	0.054
Junior H.S.	-0.0635	0.000	0.0314	0.002	0.0030	0.829	-0.0501	0.000	0.0792	0.000
Senior H.S.	-0.1384	0.000	-0.0141	0.116	0.0075	0.568	-0.1023	0.000	0.2472	0.000
Academy	-0.1231	0.000	-0.0754	0.000	-0.0395	0.081	-0.0868	0.000	0.3248	0.000
University	-0.1032	0.000	-0.0966	0.000	-0.1030	0.000	-0.0940	0.000	0.3967	0.000
Age19-21	0.0077	0.257	-0.0555	0.000	0.1165	0.000	-0.0072	0.254	-0.0615	0.000
Age22-24	0.0443	0.000	-0.0709	0.000	0.1771	0.000	-0.0101	0.137	-0.1405	0.000
Head of HH	0.1287	0.000	-0.1222	0.000	0.1517	0.000	0.0277	0.011	-0.1859	0.000
1 child	-0.0016	0.779	0.0046	0.367	0.0013	0.852	0.0044	0.455	-0.0087	0.189
>=2 children	0.0089	0.211	0.0025	0.682	-0.0071	0.421	0.0184	0.016	-0.0227	0.005
year97	0.0009	0.905	0.0128	0.082	0.0307	0.002	-0.0264	0.000	-0.0181	0.053
year98	0.0245	0.026	0.0253	0.016	-0.0945	0.000	0.0393	0.001	0.0054	0.672
year99	0.0013	0.903	0.0130	0.224	-0.1135	0.000	0.0467	0.000	0.0525	0.000
year2000	0.0132	0.232	0.0070	0.478	-0.0510	0.000	-0.0215	0.033	0.0523	0.000
year2001	-0.0079	0.387	0.0209	0.025	0.0176	0.124	-0.0459	0.000	0.0153	0.187
year2002	-0.0090	0.220	-0.0068	0.334	0.0111	0.228	-0.0611	0.000	0.0658	0.000
year2003	-0.0152	0.036	-0.0098	0.164	0.0192	0.040	-0.0737	0.000	0.0795	0.000

Note: All regressions include province dummies. Estimated by Multinomial Logit.
Number of obs = 34387
Wald chi2(172) = 5285.83
Prob > chi2 = 0
Pseudo R2 = 0.0864

Married male youths are more likely to be either paid employees or self-employees. In contrast, married female youths are less likely to be paid employees in the covered sector and are more likely to be unpaid family workers or self-employees in the uncovered sector. By working in the uncovered sector, married females generally have more flexible working hours to combine with their household responsibilities, while the covered sector usually needs more commitment and fixed working hours.

In terms of education, the most interesting finding is that youths with a university degree more likely to be unemployed compared to young people with no educational qualifications (the marginal effects are 0.397 and 0.351 for males and females respectively). This effect is much higher than those in the aggregate employment equation. Firstly, it implies that the linkage between education and the labour market (school-to-work transition) is relatively weak in Indonesia. Besides there still being a gap between the education curriculum and the labour market needs, some education institutions also lack career counselling, internships and work experience programmes. Therefore, as pointed out by Indonesia Youth Employment Network (2003), young people have longer periods of unemployment than adults. Secondly, the result also implies that only young people with a high education level (usually with a higher family income) are able to remain unemployed, while young people with a low education level (usually with a lower family income) could not afford to be unemployed and will find a job either in the informal or formal sector but with lower wages.

As presented in tables 6.27 and 6.28, an increase in minimum wage decreases the probability of young people being paid employed and earning a wage at or above the minimum wage level. The effects are relatively similar between men and women with a marginal effect of 0.197 for males and 0.203 for females. Compared to the total employment, the marginal effects are slightly higher, implying that young people are more likely to be hurt by the minimum wage, particularly in the firms that strictly comply with the minimum wage policy.

On the other hand, an increase in minimum wage raises the probability of young people being employees paid below the minimum wage level (the marginal effect is

0.221 for males and 0.258 for females). As discussed above, the firms that are not complying with the minimum wage policy are mainly found in small enterprises, due to the lack of enforcement and effective trade unions in these sectors.

Table 6.28 Youth Employment Equation in Urban Areas, Females (5 employment categories)

	Self-Employed		Unpaid Family Worker		Paid Employment (>=MW)		Paid Employment (<MW)		Unemployed	
	M.E.	P value	M.E.	P value	M.E.	P value	M.E.	P value	M.E.	P value
Lrealmw	-0.0058	0.763	0.0047	0.849	-0.2027	0.000	0.2584	0.000	-0.0546	0.041
Married	0.1217	0.000	0.1336	0.000	-0.0180	0.021	-0.1124	0.000	-0.1250	0.000
Primary	0.0011	0.887	0.0038	0.764	0.0622	0.003	-0.0415	0.001	-0.0256	0.183
Junior H.S.	-0.0130	0.074	0.0302	0.018	0.1115	0.000	-0.1316	0.000	0.0029	0.880
Senior H.S.	-0.0569	0.000	-0.0363	0.002	0.1402	0.000	-0.2334	0.000	0.1864	0.000
Academy	-0.0712	0.000	-0.1014	0.000	0.1229	0.000	-0.1494	0.000	0.1990	0.000
University	-0.0762	0.000	-0.1107	0.000	0.0180	0.573	-0.1823	0.000	0.3512	0.000
Age19-21	0.0334	0.000	-0.0649	0.000	0.0871	0.000	0.0089	0.258	-0.0645	0.000
Age22-24	0.0599	0.000	-0.0643	0.000	0.1360	0.000	0.0084	0.331	-0.1401	0.000
Head of HH	0.0658	0.000	-0.1497	0.000	0.2499	0.000	-0.0011	0.950	-0.0645	0.000
1 child	0.0051	0.278	-0.0034	0.556	-0.0270	0.000	0.0267	0.000	-0.1401	0.000
>=2 children	0.0071	0.226	-0.0177	0.012	-0.0396	0.000	0.0426	0.000	0.0076	0.431
year97	-0.0161	0.004	0.0061	0.475	0.0706	0.000	-0.0441	0.000	-0.0165	0.115
year98	-0.0020	0.817	0.0251	0.041	-0.0450	0.000	0.0065	0.640	0.0154	0.289
year99	-0.0144	0.096	0.0079	0.537	-0.0653	0.000	0.0160	0.280	0.0558	0.000
year2000	-0.0192	0.011	0.0074	0.513	-0.0096	0.453	-0.0287	0.021	0.0502	0.001
year2001	-0.0334	0.000	0.0076	0.464	0.0513	0.000	-0.0604	0.000	0.0350	0.009
year2002	-0.0417	0.000	-0.0111	0.183	0.0367	0.000	-0.0753	0.000	0.0914	0.000
year2003	-0.0315	0.000	-0.0107	0.211	0.0624	0.000	-0.1165	0.000	0.0963	0.000

Note: All regressions include province dummies. Estimated by Multinomial Logit.
Number of obs = 27108
Wald chi2(172) = 6207.48
Prob > chi2 = 0
Pseudo R2 = 0.1132

Compared to the other studies, the findings are relatively close to Moretti and Perloff (2000) and Hinnosaar and Room (2003). Moretti and Perloff (2000) found that an increase in minimum wage increased the probability of agriculture workers being paid less than the minimum wage level with a marginal effect of 0.017. According to them, a significant number of agriculture workers are paid below the minimum wage level in the agriculture sector because of lack of enforcement or due to receiving other compensation, indicating an incomplete compliance. On the other hand, Hinnosaar and Room (2003) found that an increase in the Estonian minimum wage increased the probability of being paid below the minimum wage by 2%. They argued that an increase in minimum wage decreased the rate of compliance with the minimum wage policy in Estonia, where the enforcement is relatively low.

The other interesting finding is that the effect of minimum wage on paid employed youths with a wage below the minimum wage level is stronger than on the self-employed youths. According to Indonesia Youth Employment Neetwork (2003), there are some barriers for Indonesian young people to working as a self employee, compared to adults. Firstly, most self-employed jobs need adequate funding. The problem is that most young people lack access to credit loans or financial assistance from the official financial institutions due to their limited collateral. Therefore, the easier way to get funding is to borrow money from their family or friends, where the amount is very limited. In addition, as pointed out by Rice (2004) the failure probability among "new" self-employed is usually high because of the limited knowledge in their new environment. Secondly, it seems that young people lack the entrepreneurial culture (see Indonesia Youth Employment Network, 2003 for further discussion). In this case, they are more likely to work as a paid employee with a permanent wage, although with a rate below the minimum wage level, rather than being a self employee with a relatively unstable income. In addition, the ILO (2003) survey finding confirmed that only one-half to two-thirds of self-employed youth is more likely to remain self-employed, while the others tend to move to paid employment if there is a possibility. This situation tells us that being a self employee seems a last resort for those unable to enter the formal sector but need an income to make a living.

Table 6.29 Youth Employment Equation in Rural Areas, Males (5 employment categories)

	Self-Employed		Unpaid Family Worker		Paid Employment (>=MW)		Paid Employment (<MW)		Unemployed	
	M.E.	P value	M.E.	P value	M.E.	P value	M.E.	P value	M.E.	P value
Lrealmw	-0.0320	0.069	0.0327	0.106	-0.0511	0.000	0.0922	0.000	-0.0418	0.001
Married	0.1232	0.000	-0.0326	0.000	0.0107	0.062	-0.0103	0.059	-0.0910	0.000
Primary	-0.0051	0.365	0.0047	0.485	0.0143	0.010	-0.0189	0.000	0.0050	0.405
Junior H.S.	-0.0275	0.000	-0.0048	0.503	0.0229	0.000	-0.0465	0.000	0.0559	0.000
Senior H.S.	-0.0845	0.000	-0.1034	0.000	0.0236	0.001	-0.0547	0.000	0.2190	0.000
Academy	-0.1524	0.000	-0.2169	0.000	0.0228	0.450	0.0002	0.995	0.3462	0.000
University	-0.1271	0.007	-0.2468	0.000	-0.0511	0.117	0.0135	0.720	0.4116	0.000
Age19-21	0.0436	0.000	-0.0816	0.000	0.0555	0.000	0.0010	0.785	-0.0185	0.000
Age22-24	0.0737	0.000	-0.1108	0.000	0.0860	0.000	0.0058	0.174	-0.0547	0.000
Head of HH	0.3458	0.000	-0.3737	0.000	0.0512	0.000	0.0535	0.000	-0.0768	0.000
1 child	-0.0048	0.251	-0.0027	0.565	0.0068	0.057	0.0021	0.548	-0.0013	0.699
>=2 children	-0.0010	0.845	-0.0029	0.602	0.0094	0.047	0.0042	0.338	-0.0096	0.019
year97	-0.0362	0.000	0.0148	0.027	0.0252	0.000	0.0014	0.748	-0.0052	0.319
year98	-0.0211	0.007	0.0399	0.000	-0.0117	0.081	-0.0045	0.498	-0.0026	0.698
year99	-0.0358	0.000	0.0227	0.025	-0.0373	0.000	0.0102	0.165	0.0402	0.000
year2000	-0.0413	0.000	0.0244	0.009	-0.0206	0.001	-0.0317	0.000	0.0691	0.000
year2001	-0.0752	0.000	0.0202	0.018	0.0154	0.023	-0.0253	0.000	0.0649	0.000
year2002	-0.0455	0.000	-0.0298	0.000	0.0052	0.325	-0.0187	0.000	0.0888	0.000
year2003	-0.0709	0.000	0.0226	0.002	0.0022	0.673	-0.0410	0.000	0.0871	0.000

Note: All regressions include province dummies. Estimated by Multinomial Logit.
Number of obs = 60672
Wald chi2(172) = 11930.05
Prob > chi2 = 0
Pseudo R2 = 0.1186

The results of the minimum wage effect on youth employment in rural areas are presented in tables 6.29 and 6.30. As discussed above, the minimum wage is less effective in rural areas due to the dominance of the agriculture sector. In addition, the fraction of young workers who earn a wage below the minimum wage level is much bigger than those in urban areas (see table 6.26). Therefore, we might expect that the effect of the minimum wage is smaller (or may have no effect) than that found in urban areas.

Table 6.30 Youth Employment Equation in Rural Areas, Females (5 employment categories)

	Self-Employed		Unpaid Family Worker		Paid Employment (>=MW)		Paid Employment (<MW)		Unemployed	
	M.E.	P value	M.E.	P value	M.E.	P value	M.E.	P value	M.E.	P value
Lrealmw	-0.0799	0.000	0.0623	0.022	-0.0356	0.004	0.1019	0.000	-0.0487	0.007
Married	0.0893	0.000	0.1680	0.000	-0.0381	0.000	-0.0638	0.000	-0.1555	0.000
Primary	0.0003	0.963	-0.0181	0.023	0.0120	0.033	-0.0196	0.000	0.0255	0.001
Junior H.S.	-0.0126	0.055	-0.0592	0.000	0.0375	0.000	-0.0538	0.000	0.0882	0.000
Senior H.S.	-0.0602	0.000	-0.2196	0.000	0.0483	0.000	-0.0309	0.000	0.2625	0.000
Academy	-0.1409	0.000	-0.3599	0.000	0.0860	0.001	0.0852	0.002	0.3296	0.000
University	-0.1478	0.000	-0.3393	0.000	0.0708	0.063	0.0126	0.725	0.4036	0.000
Age19-21	0.0291	0.000	-0.0473	0.000	0.0334	0.000	0.0086	0.064	-0.0238	0.000
Age22-24	0.0615	0.000	-0.0612	0.000	0.0454	0.000	0.0181	0.001	-0.0638	0.000
Head of HH	0.3824	0.000	-0.4262	0.000	0.1105	0.000	0.0823	0.000	-0.1489	0.000
1 child	0.0089	0.061	-0.0021	0.731	-0.0088	0.004	0.0051	0.231	-0.0030	0.512
>=2 children	0.0072	0.211	0.0054	0.456	-0.0060	0.111	-0.0081	0.117	0.0015	0.791
year97	-0.0380	0.000	0.0131	0.112	0.0203	0.000	0.0017	0.755	0.0029	0.684
year98	-0.0442	0.000	0.0295	0.013	0.0065	0.318	0.0067	0.434	0.0015	0.872
year99	-0.0505	0.000	-0.0157	0.219	-0.0029	0.650	0.0076	0.403	0.0615	0.000
year2000	-0.0581	0.000	0.0065	0.560	0.0043	0.481	-0.0190	0.008	0.0662	0.000
year2001	-0.0720	0.000	-0.0082	0.441	0.0160	0.019	-0.0251	0.000	0.0892	0.000
year2002	-0.0377	0.000	-0.0635	0.000	0.0207	0.000	-0.0406	0.000	0.1211	0.000
year2003	-0.0748	0.000	-0.0114	0.208	0.0040	0.428	-0.0465	0.000	0.1287	0.000

Note: All regressions include province dummies. Estimated by Multinomial Logit.
Number of obs = 40437
Wald chi2(86) = 8980.52
Prob > chi2 = 0
Pseudo R2 = 0.1262

As presented in tables 6.29 and 6.30, the minimum wage is negatively associated with the probability of young people being paid employed in the covered sector. However, the effect is much lower than those found in urban areas, indicating that the minimum wage is less binding in rural areas. On the other hand, there is a significant positive effect of the minimum wage on young workers paid below the minimum wage level (in the uncovered sector). The result is similar to what is found in urban areas although the marginal effect is much smaller.

Another interesting finding relating to young people in rural areas is that the real minimum wage has a negative marginal effect for the self-employed and unemployed categories. Firstly, it seems that an increase in the minimum wage has encouraged unemployed youths to participate in the uncovered sector for an additional family income, due to some job losses in the covered sector. Secondly, another possible reason is that an increase in minimum wage has attracted those unemployed (and self-employed) to migrate from rural areas to urban areas where the minimum wage is more binding and the average wage is much higher[42]. As pointed out by ILO (2003), migration is an important factor affecting youth employment. This migration is not only in the case of the least educated youths, but also of the educated youths. A relative scarcity of jobs in the formal sector has also forced young people to leave for urban areas, rather than work in unsuitable jobs or in the informal sector in rural areas (see Jones et al, 1998). However, the expansion of the number of young workers from rural areas in urban areas will create another problem, the fact that labour absorption capacity in the urban formal sectors is very limited. Besides limited labour absorption capacity, young workers tend to have limited knowledge of the employment opportunities in their new environment (ILO, 2003). It makes the situation more difficult for young workers. As a result, young people who are unable to find a job in the urban formal sectors have no choice other than to enter the informal sector or to be paid below the minimum wage level in urban areas. According to the ILO survey,

[42]Similarly, Fajnzylber (2001) found that an increase in the minimum wage in Brazil has attracted the informal sector workers to move into the formal sector, where the minimum wage is more binding.

more than 50% of self-employed youth in some urban areas, such as Jakarta, come from poor rural areas.

An interesting further area of study revealed by these findings is how the minimum wage policy motivated the employment in rural areas to migrate to urban areas, where the average earnings are higher and the minimum wage is more binding. Unfortunately, the Indonesian Labour Force Survey does not report the migration data from rural to urban areas.

6.6 Conclusions

This study has investigated the effects of the minimum wage on employment and wage distribution using an individual micro-level data set. Since the data set is not a panel, I have applied pooled cross-sectional time-series methodology to explore the impact of the minimum wage across individual workers. In general, this study has modified the methodology used by Gindling and Terrell (2005 & 2007) in Costa Rica. To provide more complete results, all of the equations are analyzed separately in urban and rural labour markets, as well as the male and female labour market.

Firstly, in terms of the wage equation, this study found that an increase in minimum wage increases the individual's monthly wage for both men and women in urban and rural areas. It is suggested that the coefficient of the log of real minimum wage in the female labour market is slightly higher compared to the male labour market, indicating that the minimum wage is more binding for women. In addition, the effect of the minimum wage is relatively stronger in urban areas than in rural areas because rural areas are not greatly affected by the minimum wage due to the dominance of the agriculture sector.

This study also estimated the effect of the minimum wage on the individual's monthly wage throughout the distribution. Using quantile regression, this study found that the effects of the minimum wage on the individual's monthly wage are positive and significant throughout the distribution across gender and location, representing the extensive "spillover" and "lighthouse" effects. In general, the effect of the minimum wage is strongest at the bottom of the distribution and will decline monotonically afterwards, indicating that there is a tendency for the minimum wage to compress the wage distribution.

Secondly, in terms of employment equation, I examined the effect of the minimum wage on the probability of being employed according to the employment status using multinomial logit model. Unlike the previous studies, I have classified the labour market into several employment categories including worker employed in uncovered sector (i.e. self-employed and unpaid family worker), worker employed in covered sector (i.e. paid employment) and unemployed.

Interestingly, the findings show that male and female employment responds differently across the urban-rural location if the minimum wage increases. In urban areas, generally, an increase in the minimum wage is more likely to decrease the probability of being employed in the covered sector and to increase the probability of being employed in the uncovered sector, as suggested by the two-sector model. Specifically, within the uncovered sector, female workers are more likely to be engaged as unpaid family workers, while male workers tend to become self-employees. In addition, I found the displacement effect is stronger for women, indicating that female workers are the more likely to be hurt as the result of an increase in minimum wage. Compared to urban areas, the effects in rural areas are somewhat lower, indicating that minimum wage is less binding, given the dominance of the traditional agriculture sector.

Thirdly, I found that an increase in minimum wage is associated with a decrease in the probability of young people being a paid employee who earns a wage at or above the minimum wage level. On the other hand, interestingly, I found that an increase in minimum wage will increase the probability of young people being a paid employee who is paid below the minimum wage level, given their barriers when looking for a job. This result implies that young workers are one of the most vulnerable sectors of employment to be affected by an increase in minimum wage.

By implication, this study found that an increase in minimum wage which is designed to create a higher standard of living in the formal sectors will also have a big impact on the uncovered informal sectors. As discussed above, an increase in minimum wage will displace some covered formal sector workers to the uncovered informal sector to maintain appropriate income for survival. Compared to the covered sector, employment in the uncovered informal sectors usually does not benefit from permanent job security, health insurance, and old-age pensions. In consequence, it could be predicted that household consumption expenditure tends to be higher compared to those who are still working in the formal sector. Moreover, the expansion of employment from the formal covered sector to the informal uncovered sector will create another problem because the labour absorption capacity in the uncovered informal sectors is limited. Therefore, this displacement effect is predicted to decrease the earnings in the informal sectors. If our prediction is correct, as a consequence, the number of people who are living below the poverty line will increase. As a result, a comprehensive strategy of poverty reduction that also creates more job opportunities is urgently needed by the Indonesian government.

Secondly, I found that female and youth employment are the sectors of employment that are most likely to be hurt by an increase in the minimum wage. As in other developing countries, women generally have less education opportunities than men. Therefore, it is not surprising that women have greater barriers to entering the labour market because of their low education and discrimination in the same sector of activities. In this case, the government needs to ensure equality of access to education and the labour market for them. For youth employment, the government needs to strengthen the education and training system for the school-to-work transition to fill the gap with what the labour market needs. To achieve this objective, all the relevant stakeholders should be actively involved, including government, employers (particularly private sector), and university (school).

CHAPTER VII

THE EFFECTS OF CHANGES IN MINIMUM WAGE ON HOURS WORKED IN INDONESIA:
Evidence from selection biased corrections model

7.1. Introduction

A standard competitive model suggests that a minimum wage which is above equilibrium level will reduce demand for labour. Based on the standard literature, the effects of an increase in minimum wage on demand for labour can be analysed from employers' decisions on how many workers would be employed (a stock variable) and how many hours they should work (a flow or utilization variable) (see Hart, 1987 and Hamermesh, 1993). On the demand side, employers, therefore, have the option of either (or both) changing the number of workers employed or changing the number of hours worked of their existing workers in response to an increase in minimum wage. Specifically, Hamermesh (1993) pointed out that, in response to minimum wage, employers might reduce (or increase) the number of workers employed (employment) at the *extensive* margin, while on the other hand employers might also adjust the labour utilization at the *intensive margin* by changing their working time or changing the relative use of their full-time and part-time employment of the existing workers.

The previous chapters presented empirical evidence on the effects of minimum wage on employment in terms of workers using regional and individual level data. In this chapter, this study focus specifically on the effects of minimum wage on hours worked as an alternative measure to employment, providing a complete analysis of any shifts in labour demand (see Stewart and Swaffield, 2008).

Based on the established theoretical framework, the effect of a change in minimum wage on hours worked per worker is ambiguous (Stewart and Swaffield, 2008). In the presence of high fixed employment costs (such as hiring costs, training costs, and fringe benefits), an increase in minimum wage has been predicted to cause an increase in hours worked of workers who remain employed (usually high-skilled workers) and to cause a decrease in the number of low-skilled workers (Metcalf, 2008). This evidence suggests that employers make adjustments by employing their existing workers for longer hours in order to compensate for a decrease in the number of workers employed as minimum wage increases, implying a substitution effect between hours worked and employment (Stewart and Swaffield, 2008 and Gindling and Terrell, 2007).

In contrast, if the fixed employment costs are relatively low, an increase in minimum wage tends to raise variable employment costs (such as hourly wages) relative to fixed employment costs, suggesting that employers are likely to make adjustments by employing their existing workers for less hours and hiring more workers (Costa, 2000 and Connolly and Gregory, 2002). However, in the long run, this increase in employment (workers) might be offset by employing more capital than workers, suggesting a potential decrease in both hours and employment (Costa, 2000).

Considering the scale effect, Michl (2000) argued that, using normal inputs, an increase in minimum wage is predicted to increase total labour costs. According to the standard competitive market model, an increase in labour costs induces employers to raise output price, suggesting a decrease in the demand for output. By implication, employers would be predicted to reduce their demand for hours of labour, as well as demand for workers, unambiguously.

Although there are some empirical studies about the effects of minimum wage on hours worked in developed countries (see for example Zavodny, 2000, Couch and Wittenburg, 2001, and, Stewart and Swaffield, 2008), the empirical studies of the effect of a change in minimum wage on hours worked in developing countries are very limited. In practice, the effect of minimum wage varies depending on the labour market characteristics and the domination of the substitution or the scale effects. Evidence from Costa Rica using panel data across industries indicates that an increase in minimum wage increased hours worked, suggesting the presence of monopsony power (El-Hamidi and Terrell, 2002). In Brazil, Lemos (2004d) found some positive effects of minimum wage on number of hours worked (hours effect) using regional panel data analysis, although the effect on the employment rate (jobs effect) was negative. In a more recent study, Gindling and Terrell (2007) found that an increase in the Costa Rican minimum wage reduced the number of hours worked per worker in the covered sector using an individual micro level data set.

This study specifically examines the effect of a change in minimum wage on hours worked of paid employment in Indonesia. Relating to hours worked, the regional minimum wages in Indonesia are primarily set for full-time workers based on monthly terms (not hourly terms) minimum wage with a standard of 40 hours worked per week (see Rama, 2001). Based on previous minimum wage studies, it is not clear how the minimum wage affects hours worked in terms of monthly minimum wage, since the previous empirical studies and theoretical predictions are mainly based on hourly minimum wage analysis. This is actually one of the reasons why the effect of minimum wage on hours worked in Indonesia is an interesting topic, particularly in the context of developing country studies. Although the minimum wage is primarily set for full-time workers, based on government regulation, minimum wage level is also flexible and can be adjusted for part-time workers who work less than 40 hours per week on a pro-rata basis. In addition, the overtime wage rates (overtime premium) will also be applied for workers who work more than 40 hours per week.

This study explores a complete specification on the impact of minimum wage on hours worked of paid employment, using the Indonesian Labour Force Survey (Sakernas) from 1996 to 2003. Following a similar pooled cross-sectional time-series data methodology to the previous section, this study contributes to the previous developing countries literature in two respects. Firstly, compared to the existing developing countries literature, the sample selection corrections based on a multinomial logit for a potential selection bias from a non-random sample will be taken into account. This is important particularly to control for the potential selection bias arising from the correlation between the unobserved factors that affect the choice of employment sectors (i.e. covered and uncovered sectors) and the unobserved factors that affect their hours worked. In practice, individuals who expect fixed (or standard) working hours are more likely to select themselves (self-selection) into the paid employment category, while individuals who expect more flexible (part-time) working hours might put themselves into uncovered sector employment (such as the self-employed and unpaid family workers categories), leading to potential sample selection bias in the OLS estimates.

Specifically, this study compares the estimates from two different approaches to correct for a potential selection bias based on multinomial logit, including Lee's (1983) and Bourguignon et al's (2007) selection biased correction approaches. This comparison is necessary to obtain the most robust specification in examining the effect of minimum wage on hours worked in Indonesia. Further detail about Lee's and Bourguignon et al's methods is presented in the research methodology section below.

Secondly, this study extends the hours worked specification by analysing the effects of minimum wage on hours worked separately across individuals in different groups of workers, in terms of gender (male-female workers) and their residences (urban-rural areas). As discussed in the previous chapter, male and female workers behave differently as minimum wage increases because they have different labour market characteristics. Female workers with young children in their household, for example, tend to work shorter hours (part-time) because of their domestic responsibilities. In addition, workers in urban and rural areas also have a different range of compliance in minimum wage policy as minimum wage is more effectively enforced in urban areas than in rural areas. In urban areas, on average, more than 70% of paid employment is paid at or above the minimum wage level, while in rural areas around 60% of paid employment is paid at or above the minimum wage level (see table 6.17 in the previous chapter). Although Gindling and Terrell (2007) estimated separate equations for workers in the covered and uncovered sectors, they have not specifically separated the effects of minimum wage by gender and their residences.

The rest of this chapter is structured as follows. The second section describes the Indonesian hours of work conditions in practice. The third section examines the theoretical framework used in this study. The fourth section discusses the literature review of previous studies on the effects of minimum wage on hours worked. The fifth section describes the research methodology used in this study. The sixth section summarises the data used in this study. The seventh section reports the findings. Finally, the last section provides conclusions and policy implications.

7.2. Hours Worked in Practice

Based on government regulations, the official standard working hours for workers in Indonesia are 40 hours per week (equivalent to 8 hours per day for business with 5 days of work or 7 hours per day for business with 6 days of work)[43]. Compared to the other developing countries, standard working hours in Indonesia are slightly lower. In comparison, the standard working hours for Chile and Mexico are 48 hours per week, 44 hours per week for South Korea, while for Malaysia it is the same as Indonesia, at 40 hours per week (Nayar, 1996). In addition to the standard working hours, Indonesian workers are allowed to work 3 hours overtime per day or 14 hours overtime per week (equivalent to a maximum of 54 hours in total for the workweek) with the overtime wage rates (the so-called overtime premium). The overtime premium is set at 1.5 times the normal hourly wage for the first overtime hour and twice the normal hourly wage for subsequent hours.

However, in practice, most industries in the manufacturing sector (and some other sectors) are likely to apply 48 hours per week (equivalent to 8 hours per day for businesses with 6 days per week) as the normal working hours (without overtime premium) for their workers, which is 8 hours longer than the official standard working

[43] The Indonesian Ministry of Manpower Regulation No. 102/2004

hours based on government regulation (see Irawan et al, 2000). Related to this issue, according to Tjandraningsih (2000), most industries, particularly in textile, garment, and footwear (TGF)[44] industries, applied so-called "compulsory overtime". In other words, although the working hours in the manufacturing sector are relatively longer (overtime) than the official standard working hours based on the regulation, this overtime is considered as normal working hours (with standard rate payment). Pangestu and Hendytio (1997) found that only 30% of workers in the manufacturing sector received the overtime premium based on the government regulation, although more than 70% of workers in the manufacturing sector are reported to work overtime (more than 40 hours per week). In practice, most of the TGF industries made their own overtime rates and did not comply with the government regulation for their overtime payment, usually at constant rates (see Tjandraningsih, 2000). In this case, government seems to allow employers to apply flexible standard working hours for their workers, as long as there is a mutual agreement between employers and their workers. As a result, workers are more likely to be in a vulnerable position because of non-compliance with the government regulation and the limited effectiveness of the labour union to ensure the compliance of government regulation. In addition, according to Pangestu and Hendytio (1997), workers' knowledge of standard overtime payment is also limited. More than 90% of survey responses from women workers do not know specifically about the detailed overtime payment regulation.

According to Pangestu and Hendytio (1997), there are two main reasons for non-compliance to the overtime premium by employers based on government regulation. The first is the fact that employers have limited financial capacity to offer the statutory

[44]TGF industries have been the main industries in the Indonesian manufacturing sectors.

overtime wage rates and other benefits to their workers, particularly during the slowdown of the economy. The second reason is a lack of enforcement capabilities of the government. The Legal Aid Institute of Surabaya (1998) confirmed from their survey on wages of workers in East Java that there is a weak control of the government on the firms who fail to comply with the regulation. In practice, there are no effective sanctions from the government for those employers who do not comply with the regulation. Thus far, the focus of the government enforcement is minimum wage compliance, although it is also not really effective and is limited to large and medium enterprises[45]. This over-consideration by the government to minimum wage compliance in practice has made employers compensate for their higher labour costs as minimum wage increases by reducing other labour costs, including costs for the overtime premium (Pangestu and Hendytio, 1997)[46]. However, most workers seem to overlook this evidence, particularly due to their limited knowledge, ineffective labour unions, and a low level of education. Although the overtime rate is relatively lower than the official standard overtime payment from the government (or perhaps the same rate as normal hourly wages), workers will continue to work overtime, due to the fact that their total earnings still increase (see Pangestu and Hendytio, 1997). In this case, workers have limited choices for additional income rather than enter the informal sector or are paid below the minimum wage level.

[45] Suryahadi et al (2001) reported from their survey that less than 5% of workers in large and medium enterprises are paid below the minimum wage level, while more than 60% of workers in small enterprises are paid below the minimum wage level.

[46] In addition, Nayar (1996) also found evidence that employers compensate the minimum wage increases in Indonesia by reducing the holiday bonus payments.

Table 7.1 Average Hours Worked per week of Paid Employment by Gender, Location, and Sector (Pooled Data 1996-2003)

	Urban Areas			Rural Areas		
	Male	Female	Total	Male	Female	Total
Sector:						
Agriculture	43.36	31.78	39.91	39.90	31.87	37.10
Mining	47.59	40.24	47.11	45.92	40.09	45.38
Electricity	43.31	41.22	43.10	42.98	39.88	42.71
Construction	47.51	46.33	47.46	47.66	47.18	47.64
Transportation	51.88	46.74	51.50	52.30	46.37	52.12
Finance	44.40	42.74	43.89	44.68	40.75	43.64
Manufacturing	47.41	45.46	46.71	46.81	43.35	45.58
Trade	50.55	50.06	50.37	50.11	49.98	50.07
Services	41.76	41.41	41.62	39.60	38.14	39.10
Total	45.78	43.27	44.98	43.58	37.52	41.85

Source: Calculated from Sakernas

Table 7.1 shows the average hours worked in paid employment categorised by gender, location (residence) and sector. As shown, there is a substantial variation in the hours worked of different groups of workers. In both urban and rural areas, workers in the transportation and trade sector, which usually do not require fixed hours worked per week, tend to work longer hours than the other sectors. Moreover, workers in the agriculture sector were, on average, working fewer hours due to a domination of part-time workers. In practice, hours worked of workers in the agriculture sector are likely to be seasonal. In addition, female workers tend to work shorter hours (part-time work) than male workers, particularly because of their domestic responsibilities that require less working hours.

Table 7.2 Full-time and Part-time Paid Employment by Gender and Location (Pooled Data 1996-2003)

	Urban Areas			Rural Areas		
	Male	Female	Total	Male	Female	Total
Full-time	66,182 (73.59%)	25,724 (61.81%)	91,906 (69.87%)	46,579 (64.62%)	13,051 (44.66%)	59,630 (58.86%)
Part-time	23,750 (26.41%)	15,891 (38.19%)	39,641 (30.13%)	25,503 (35.38%)	16,174 (55.34%)	41,677 (41.14%)
Total	89,932 (100%)	41,815 (100%)	131,547 (100%)	72,082 (100%)	29,225 (100%)	101,307 (100%)

Source: Calculated from Sakernas

Although the minimum wage is set based on monthly terms for full-time workers (40 working hours per week), minimum wage policy also covers part-time workers (workers who work less than 40 hours per week) using some adjustment on a pro-rata basis, depending on how many days and hours they worked[47]. As pointed out by Smyth (1995) and Dhanani (2004), part-time work is attractive for some workers at particular stages of their life-cycle, for example, women with young children and young people who are attending school, due to the fact that there is no need for them to work full-time or other tasks make it impossible to work full-time (or permanently). In practice, as presented in table 7.2, the majority of part-time workers (more than 50%) are found in rural areas, given the dominance of agriculture sectors with seasonal and shorter working hours, while workers in urban areas are generally working full-time. However, Dhanani (2004) confirms that the dominance of part-time workers in rural areas declines over time because of the urbanization from rural to urban areas and the structural transformation from the agriculture to the manufacturing sectors during the recent period. In addition, the proportion of females who work part-time in rural areas is about 55% of total female workers in rural areas, while in urban areas it is only 38% (see table 7.2).

As pointed out by Dhanani (2004), most part-time workers are voluntarily in that status. As presented in table 7.3, less than 10% of part-time workers were looking for additional work, indicating a big proportion of voluntary part-time workers in Indonesia. This condition implies that the incidence of part-time workers in Indonesia is mostly dominated by supply-side effects. In addition, part-time workers are typically characterized by flexible working time and casual jobs that are paid on a piece-rate basis or a daily basis (Smyth, 1995). Therefore, most of them are usually

[47] Based on the Ministry of Manpower Regulation No: PER-01/MEN/1999

not covered by a permanent contract and do not benefit from permanent job security, health insurance, and old-age pensions.

Table 7.3 Part-time Workers and ho were looking for additional or other work by gender, locations and sectors (% of total employment–Pooled data 1996-2003)

	Urban Areas			Rural Areas		
	Male	Female	Total	Male	Female	Total
Sector:						
Agriculture	8.8	4.32	6.91	9.96	4.58	7.57
Mining	7.6	-	6.51	12.17	2.82	10.79
Electricity	8.87	2.38	7.93	7.53	-	6.73
Construction	18.07	5.26	17.43	13.14	7.96	6.93
Transportation	10.82	9.77	10.73	11.81	10.95	11.5
Finance	5.68	6.66	6.2	8.63	12.68	10
Manufacturing	6.63	5.36	6.05	9.16	3.29	6.39
Trade	10.63	8.36	9.77	11.81	10.95	11.5
Services	4.58	5.49	4.98	4.78	6.86	5.55
Total	6.64	5.53	6.19	8.32	5.44	7.2

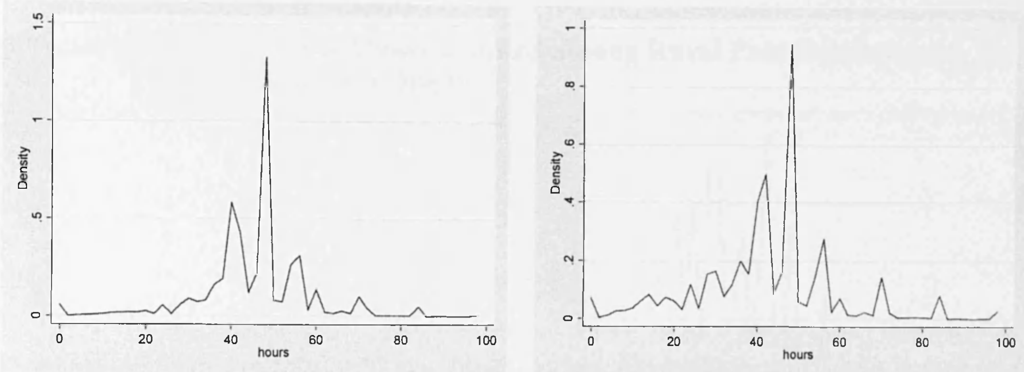
Source: Calculated from Sakernas

Figure 7.1 illustrates the kernel density estimate for the distribution of the hours worked among paid employment in urban areas using individual pooled data from 1996 to 2003[48]. The x-axis of the kernel density indicates the number of hours worked per week, while the y-axis shows the density. A spike (or a cluster) in the kernel density estimate indicates a large proportion of workers found relating to their hours worked. As we can see in figure 7.1, there is a substantial spike of workers who work around 48 hours per week for both men and women, which has to be viewed as a standard workweek particularly in the manufacturing sector. This spike actually represents around 20% of the urban workers who are working 48 hours per week during the sample periods. The second substantial spike is 40 hours (representing over 10% of the urban workers), indicating that some businesses, particularly in the public sector, have applied 40 hours per week as a normal workweek based on the

[48] The kernel density is estimated using an Epanechnicov kernel with bandwith of 0.05

government regulation. The third highest cluster is found around 54-55 hours per week, indicating the maximum hours worked allowed based on the government recommendation.

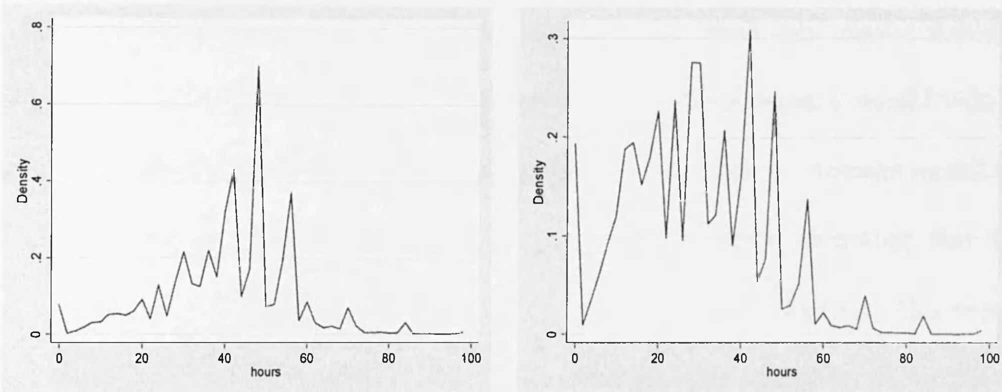
Figure 7.1. Distribution of Hours Worked among Urban Paid Employment (Pooled Data 1996-2003)



(a) Males **(b) Females**

Moreover, there is no clear spike found at less than 40 hours per week (part-time workers), although there are some clusters for female workers, supporting evidence that urban workers are mostly working full-time. In addition, there are some clusters found above 60 hours per week representing some workers with very long working hours (and usually with very low earnings) that still exist in the labour markets. Based on the labour force survey data, most of these are found working in the domestic helper activities, although Agrawal (1995) and Tjandraningsih (2000) also found some cases in the manufacturing sector. Agrawal (1995) specifically showed that workers in the manufacturing sector often were likely to work 12-14 hours per day usually without sufficient overtime payment in order to meet employer's target. On the other hand, Amnesty International (2007) also reported that many women domestic workers worked on average 70 hours per week usually without a day off during the week, confirming potential workers exploitation. In practice, the government regulation for fundamental worker's rights (such as Ministy of Manpower Regulation No. 13/2003) is more effective to be enforced to workers in business activity but less effective in private households and domestic workers (Amnesty International, 2007). The main reason is because their work takes place in the private sphere and most of them are uneducated and poor.

Figure 7.2. Distribution of Hours Worked among Rural Paid Employment (Pooled Data 1996-2003)



(a) **Males** (b) **Females**

Figure 7.2 shows the kernel density estimate for the distribution of hours worked among paid employment in rural areas mostly dominated by the agriculture sectors. For male workers, similar to the urban areas, there are significant spikes around 48 and 40 hours, indicating that most of the activities in the rural areas have also applied 48 and 40 hours per week as normal working hours (although with relatively lower density compared to urban areas) following the standard working hours in urban areas. In contrast, there are some clusters below 40 hours per week for female workers, confirming that there is a big proportion of workers in rural areas with shorter working hours (part-time workers) than workers in urban areas. It is not surprising that a concentration of part-time workers is found in the agriculture sectors or in rural areas (Dhanani, 2004).

7.3. Theoretical Framework

As mentioned in the previous section, the effect of the minimum wage on overall labour demand can be assessed through the employers' decision on how many workers should be employed and how many hours they should work (see Hart, 1987 and Hamermesh, 1993). An important starting point that motivates the analysis on the effects of minimum wage on hours worked is represented by the workers-hours demand model. In this section, the basic analysis of the employers' choice between workers and hours worked based on the conventional labour demand model will be reviewed. Later, this study modifies the basic workers-hours labour demand model for the Indonesian case where the minimum wage policy exists, assuming that the minimum wage is binding for all paid employment in the covered sector. This model will actually be used as a guide to the next section analysis regarding the empirical work on the effects of changes in minimum wage on hours worked in Indonesia.

7.3.1. Basic Workers-Hours Demand Model

Some influential analysis on the workers-hours demand model was conducted by Hart (1987) using a cost minimization approach. This model assumes that the cost of employing extra workers is not the same as the costs of hiring additional working hours. In practice, both choices relating to workers and hours require extra costs. At the *extensive margin*, employing new workers requires turnover costs, including hiring cost, termination cost and any other costs referred to the quasi-fixed cost of employment (per-worker costs), while at the *intensive margin*, hiring an additional working hour also requires extra labour costs, such as the overtime wage rates for workers who are in excess of their standard working hours (per-hour costs). As pointed out by Hart (1987), employers will employ the combinations of workers and hours up to the point where the marginal cost of employing an additional worker is equal to the marginal cost of hiring additional hours.

Following Hart (1987), suppose the total labour cost consists of variable and fixed labour costs. Therefore, the simple total labour costs (C_L) are:

$$C_L = w(h)N + ZN \tag{7.1}$$

where the first cost $w(h)$ is total wage cost per worker per period of time for a number of hours of work, representing the variable labour cost. The second cost, Z, is the fixed labour cost for each worker employed relating to their specific labour investment. N is the number of workers employed.

In the production function, it is usually assumed that the labour service (L) is a function of number of workers employed (N) and the hours worked per workers (H). N represents a stock of labour, while H shows a flow or utilization variable. The simple labour service function therefore can be specified in general form as follows:

$$L = F(h,N); \quad F_h, F_N > 0 \tag{7.2}$$

Relating to the labour service function, it is important to note that the hours worked (H) is not always positively related with the labour service but it will be declining after long hours worked, suggesting a decline in their productivity (see Hart, 1987 and Calmfors and Hoel, 1988). In contrast, the number of workers (N) tends to be positively associated with the labour service.

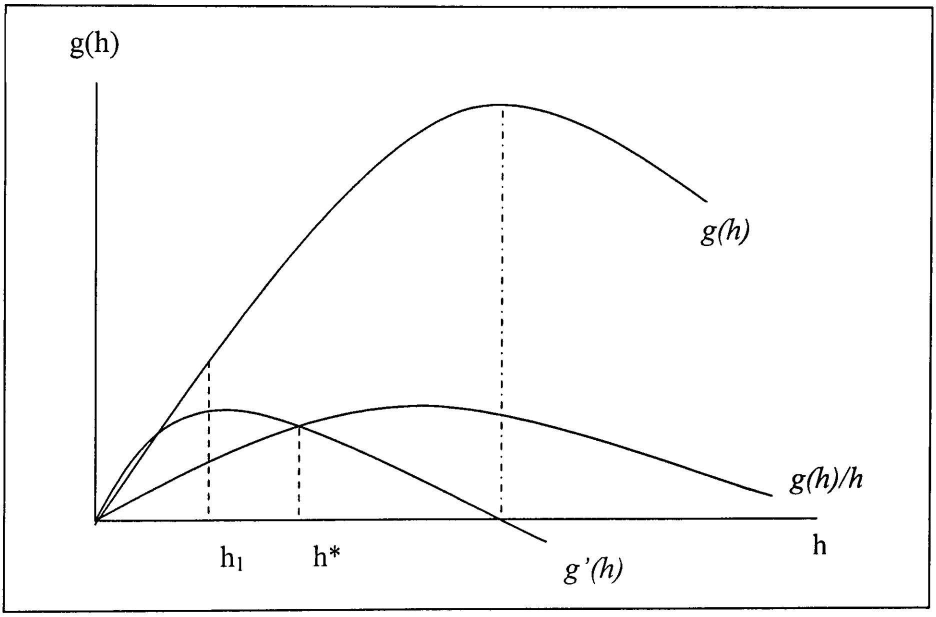
Specifically, following Ehrenberg (1971) and Hart (1987), the labour service function is modified as follows, assuming that the equilibrium of hours is independent of scale.

$$L = g(h)\, N^{1-\alpha}; \qquad (7.3)$$

$$g'(h)>0 \text{ and } g''(h)<0$$

where *g(h)* provides the relationship between the productivity of each worker being employed and their working time relating to the labour service function.

Figure 7.3 Relationship between g(h), g'(h) and g(h)/h



Source: Hart (1987)

It is suggested that productivity will increase as h increases ($g'(h)>0$) and after reaching the peak at a certain point, $g(h)$ will be diminishing as h increases ($g''(h)<0$). The main reason for this diminishing returns property is that productivity and effectiveness declines, particularly after long working hours because of a greater fatigue (Hart, 1987 and Calmfors and Hoel, 1988). This condition is illustrated in figure 7.3. $g(h)/h$ indicates the average productivity per worker being employed per hour. In terms of marginal product, it is also indicated that the marginal product, *g'(h)*, will be declining after h^*.

Supposing an employer would like to minimize its total labour costs by choosing the combination of *h* and *N* subject to the labour services constraint, the Lagrangian is as follows:

$$J = w(h)N + ZN - \lambda(L - g(h)N^{1-\alpha}) \tag{7.4}$$

where λ is the Lagrangian multiplier.

The first order conditions for this problem, therefore, are:

$$\frac{\partial J}{\partial h} = w'(h)N - \lambda g'(h)N^{1-\alpha} = 0$$

$$\frac{\partial J}{\partial N} = w(h) + Z - \lambda(1-\alpha)g(h)N^{-\alpha} = 0$$

$$\frac{\partial J}{\partial \lambda} = L - g(h)N^{1-\alpha} = 0$$

Combining the first two conditions provides:

$$\frac{w'(h)}{g'(h)} = \frac{w(h) + Z}{(1-\alpha)g(h)} \tag{7.5}$$

This equation provides the equilibrium level of the combination of *h* and *N* using the cost-minimizing approach. It confirms that firms will minimize their costs by employing the combinations of workers and hours worked up to the point where the marginal cost of employing additional workers at the extensive margin $\left(\frac{w(h)+(Z)}{(1-\alpha)g(h)}\right)$ is equal to the marginal cost of employing more hours at the intensive margin $\left(\frac{w'(h)}{g'(h)}\right)$. According to the substitution effect, if the marginal cost of employing additional workers increases relative to the marginal cost of employing additional hours, employers are therefore likely to substitute additional hours for workers. In contrast, if the marginal cost of employing more hours rises relative to the marginal cost of employing more workers, employers tend to hiring more workers and to employing less hours for their existing workers.

7.3.2. Firms with an Overtime Premium

Hart (2004) extends the analysis of workers-hours demand model in the case of the presence of overtime premium legislation. As mentioned in the previous section, the overtime wage rate (overtime premium) is applied for workers who work a larger number of hours than the standard number of working hours (so-called overtime working). The overtime premium is usually set by government legislation as a fixed multiple of the standard hourly wages. In the United States, for example, workers are paid 1.5 times the normal hourly wage in excess of their standard hours, while in Indonesia workers are paid 1.5 times the normal hourly wage for the first overtime hour and twice the normal hourly wage for subsequent hours. However, as pointed out by Hart (2004), overtime is not always paid at higher rates (premium rate) than the standard hours' rates. As an alternative, employers might offer the days off in lieu instead of premium wage rates to compensate for their overtime hours. In addition, some countries, including Sweden and the Netherlands, do not have premium wage rates legislation for workers in excess of the standard working hours (see Hart, 2004).

Similar to the previous section, Hart (2004) reviews the workers-hours demand analysis in the presence of overtime premium using cost-minimisation approach, suggesting that the hours worked are independent of scale. For simplicity, the overtime wage rate is assumed to be constant with respect to the number of overtime hours. Assuming the output is fixed, suppose an employer would like to combine their workers and working hours to minimize their costs. In the case of overtime, the total labour costs (C_L) are therefore given by:

$$C_L = w_0 h_0 N + w_1(h - h_0)N + ZN \quad ;\text{if } \ h>h_0 \tag{7.6}$$

where two different wages apply to the firms, i.e. the normal wage rates (w_0) for standard hours (h_0) and the overtime premium rates (w_1) for the overtime hours ($h - h_0$) as long as the actual working time (h) is above the standard working time (h_0). The labour services constraint is given by $L = N^{1-\alpha} g(h)$, which assumes that the equilibrium of hours is independent of scale.

Forming the Lagrangian, we have:

$$J = \lfloor w_0 h_0 N + w_1(h - h_0)N + ZN - \lambda(L - AN^{\alpha} g(h)) \rfloor \tag{7.7}$$

The first order conditions for this problem are:

$$\frac{\partial J}{\partial h} = w_1 N - \lambda A N^{\alpha} g'(h) = 0$$

$$\frac{\partial J}{\partial N} = w_0 h_0 + w_1(h - h_0) + Z - \lambda A \alpha N^{\alpha-1} g(h) = 0$$

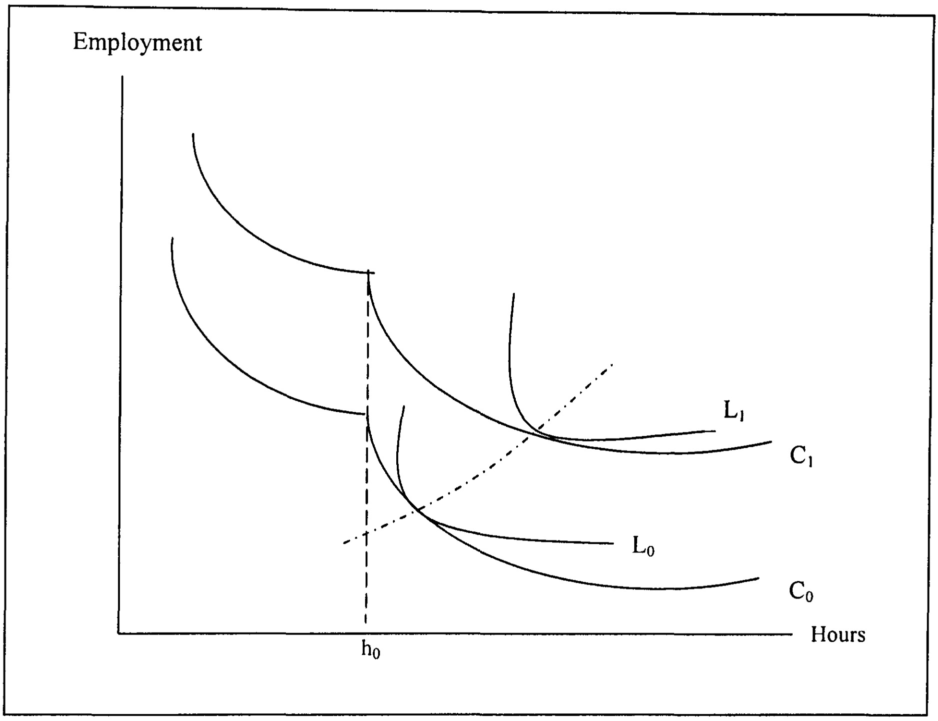
$$\frac{\partial J}{\partial \lambda} = L - AN^{\alpha} g(h) = 0$$

Combining the first two conditions give:

$$\frac{\alpha w_1}{w_0 h_0 + w_1(h - h_0) + Z} = \frac{g'(h)}{g(h)} \tag{7.8}$$

This equation has the same structure as that in the previous section. It indicates that the equilibrium level achieved when the ratio of the marginal cost to the marginal product for workers equals the ratio of the marginal cost to the marginal product for hours.

Figure 7.4. Hours and Employment Trade-Off



Source: Filer et al (1996)

Figure 7.4 presents the equilibrium level for firms with the overtime premium using isocost and isoquant analysis (see Filer et al, 1996 and Hart, 2004). The isoquant curves (L_0 and L_1) present the workers-hours combination that produces the same effective labour services. The isocost curves (C_0 and C_1) are kinked at the point where the premium rate starts to exist (h_0). Therefore, the isocost area on the left-hand-side of h_0 illustrates the area where workers work shorter hours than the standard working hours, while the isocost area on the right-hand-side of h_0 shows the area where workers work longer hours than the standard working hours (where the overtime premium is applied). In the area where the overtime premium exists, the isocost curves become steeper, indicating that every additional hour employed for the existing workers requires the sacrifice of a number of workers in order to keep the cost constant. In addition, the isocost is convex to the origin because of the diminishing marginal rates of substitution between hours and workers showing the fatigue and start-up effects that influence their productivity. The equilibrium level of the workers-hours combination, therefore, is indicated by the tangency point between the isocost and the isoquant curves.

7.3.3 The Minimum Wage Effect

Using the basic workers-hours demand model described in the previous section, the effect of minimum wage on workers-hours is discussed in this section, assuming that the minimum wage policy is binding for all paid employment (workers in the covered sector). This section can also be seen as a part of the theoretical model used in this chapter, providing an additional contribution particularly to the developing economies literature

Unlike the previous section, the profit-maximisation approach will be used, allowing the existence of the additional scale effect when minimum wage increases and assuming the output is endogenously determined. In this case, all workers-hours are assumed to be homogenous suggesting that the relative use of workers and hours are indifferent. Therefore, hours worked are assumed to be positively associated with the labour service (see equation 7.2), ignoring the productivity variation assumed in the cost-minimising approach.

Using the same labour cost function as the previous section (see equation 7.6), the total labour cost function is given by:

$$C_L = w_0 h_0 N + w_1 (h - h_0) N + ZN \quad ;\text{if } \; h > h_0 \tag{7.9}$$

where C_L is total per-worker cost, w_0 is the standard wage per hour, w_1 is the overtime premium, h is the actual hours, and h_0 is the standard normal hours. The overtime premium is assumed to be at constant rate.

In the case of Indonesia, it is assumed that the monthly minimum wage (M) is equal to the standard wage per hour (w_0) multiplied by the normal hours worked (h_0) ($w_0 h_0 \geq M$), allowing part-time workers to be included in the model. Therefore, the firms maximize the labour service as:

$$L = f(h, N) - w_0 h_0 N - w_0 k(h - h_0) N - ZN \tag{7.10}$$

Substituting minimum wage (M) for $w_0 h_0$ gives:

$$L = f(h, N) - MN - w_0 khN + kMN - ZN \tag{7.11}$$

$$L = f(h, N) - (1 - k)MN - w_0 khN - ZN \tag{7.12}$$

The first-order conditions for this problem are:

$$L_h = f_h - w_0 kN = 0 \tag{7.13}$$

$$L_N = f_N - (1 - k)M - w_0 kh - Z = 0 \tag{7.14}$$

$$L_M = -(1 - k)N = 0 \tag{7.15}$$

As pointed out by Hart (2004), the second-order sufficient conditions are satisfied if $f_{NN} < 0, f_{hh} < 0$ and $f_{hh} f_{NN} - f_{hN}{}^2 > 0$, where the last expression is the determinant of the cross-partials of the objective function (Jacobian determinant = D).

Differentiating equations 7.13 and 7.14 with respect to h, N, and M using the Cramer's rule, we obtain:

$$\begin{vmatrix} f_{hh} & f_{hN} - w_0 k \\ f_{Nh} - w_o k & f_{NN} \end{vmatrix} \begin{bmatrix} \dfrac{\partial h}{\partial M} \\ \dfrac{\partial N}{\partial M} \end{bmatrix} = \begin{bmatrix} 0 \\ (1-k) \end{bmatrix} \tag{7.16}$$

Solving this system by Cramer's rule provides:

$$\frac{\partial h}{\partial M} = \frac{\begin{vmatrix} 0 & f_{hN} - w_0 k \\ (1\text{-}k) & f_{NN} \end{vmatrix}}{D}$$

$$= \frac{-(f_{hN} - w_0 k)(1-k)}{D}$$

$$= \frac{-(f_{hN} - (f_h / N)(1-k)}{D} \tag{7.17}$$

As $f_{hN} < f_h/N$ using Cobb-Couglas, therefore, $\dfrac{\partial h}{\partial M} > 0$.

By a similar process, the effect of a change in M on N yields:

$$\frac{\partial N}{\partial M} = \frac{\begin{vmatrix} f_{hh} & 0 \\ f_{Nh}\text{-}w_0 k & (1\text{-}k) \end{vmatrix}}{D}$$

$$= \frac{f_{hh}(1-k)}{D} \tag{7.18}$$

As $f_{hh} < 0$ by assumption, the numerator is negative. Therefore $\dfrac{\partial N}{\partial M} < 0$.

As presented in equation (7.17) above, the relationship between the minimum wage (M) and the actual hours (h) is positive, while the effect of the minimum wage (M) on employment is negative. This result is consistent with the substitution effect prediction that an increase in the monthly minimum wage is predicted to decrease the number of workers and is compensated for by requiring longer hours for the existing workers, due to the fact that an increase in the monthly minimum wage is per-worker cost and not per-hour cost.

7.4. Literature Review

This section reviews the previous empirical studies in international publications on the effects of minimum wages on hours worked. According to the standard competitive model, an increase in the minimum wage is generally predicted to reduce the demand for labour. However, in the standard textbook presentations, this reduction is usually interpreted as a reduction in number of workers (employment) rather than a reduction in hours worked per worker (see for example Filer et al, 1996). In practice, besides reducing their numbers of workers at the *extensive margins*, employers might also adjust their labour utilization at the *intensive margin* by changing their workers' hours worked or changing the relative use of full-time and part-time for their existing workers (Hamermesh, 1993). In addition, Hamermesh (1993) also pointed out that, in the short run, employers are more likely to change their workers' hours worked than to change their number of workers in response to minimum wage. The potential reason is because the hours worked adjustment costs tend to be lower than the employment adjustment costs (Connolly and Gregory, 2002).

Although there are large numbers of empirical studies on the effect of minimum wage on employment, there are only a few studies that specifically focus on the effect of minimum wage on hours worked. According to Brown (1999), one of the reasons is because of data unavailability on workers' weekly hours for long time periods. One of the earliest studies that examined the effect of minimum wage on hours worked, as an alternative measure to employment, is the study of minimum wage and long run elasticity of demand for low-wage labour in the United States manufacturing sector conducted by Zucker (1973). Using a dynamic panel data method from seven non-durable goods industries, Zucker (1973) found that an increase in minimum wage reduced both the number of workers and the average weekly hours with the long-run elasticities of -0.79 and -0.91, respectively. To check the robustness of the result, he also estimated the effect of minimum wage on labour demand using a two-stage least squares method. The result remained negative and significant with the estimated elasticities of -1.01 for workers and -1.15 for hours worked, suggesting that the result was robust across different specifications. Relating to this result, Zucker (1973) argued that employers respond to an increase in minimum wage by substituting more capital for their unskilled labour (both in terms of hours worked and workers), particularly in the long run. In addition, the hours effects were relatively larger than workers effects because of high fixed employment costs.

In more recent panel data studies, Zavodny (2000) and Couch and Wittenburg (2001) found contradictory results using different sets of United States data. Couch and Wittenburg (2001) estimated the effect of the minimum wage on teenage hours worked using CPS monthly data from January 1979 to December 1992. The average hours of work by all teenagers in their primary job was employed as the dependent variable, while minimum wage measure used in the equation was the log of state minimum wage. Couch and Wittenburg (2001) found that an increase in the state minimum wage level reduced the average hours of work with an elasticity of -0.48. Similar to Zucker (1973), Couch and Wittenburg (2001) found that the hours worked elasticity was larger than the size of workers elasticity, suggesting that employers adjusted their labour utilization in the short run by changing their workers' hours rather than changing their number of workers (employment).

Zavodny (2000) employed state annual panel data for teenage workers from 1979 to 1993 to explore the effects of the minimum wage on hours and employment. Similar to Couch and Wittenberg (2001), she used the average hours worked of both "all teens" and "among teen workers" as dependent variables, while minimum wage measures were the log of real minimum wage and the log of relative minimum wage (weighted by the average adult earnings). Contrary to Couch and Wittenberg (2001), Zavodny (2000) found that an increase in minimum wage was positively associated with the teens average hours worked. The reason for this positive effect was because employers make adjustment by substituting their high-skilled teenage employment for low-skilled adult and teenage employment, indicating the presence of a dominating substitution effect. Consistent with the panel data estimate, using an individual level estimate Zavodny (2000) also found that the minimum wage was positively associated with the hours worked. Specifically, she found that an increase in minimum wage (indicated by the larger wage gap) by US$1 increased hours worked of the affected teen workers who remained employed by 4.1 hours.

A more comprehensive study using the United States data was conducted by Neumark et al (2004). Using the individual level panel data set from 1979 to 1997, they estimated the effect of minimum wage on the full set of the margins, including hourly wage, employment, hours worked, and labour income, at different points of wage distribution. Evidence from the hours effect suggested that effects of the minimum wage on hours worked were mixed, depending on the workers' position in the wage distribution. Specifically, Neumark et al (2004) found that an increase in minimum wage reduced hours worked for those who are initially paid around minimum wage level (low-wage workers) with the elasticites about -0.3. In contrast, hours worked were predicted to increase for those who are initially paid above minimum wage level (high-wage worker). Similar to Zavodny (2000), this result suggested that employers substituted their high-wage workers hours worked for low-wage workers hours worked in response to an increase in minimum wage. In addition, the lagged effects were relatively stronger than the contemporaneous effects suggesting that employers tended to adjust their workers' hours worked with lagged response.

Stewart and Swaffield (2008) investigated the effect of the 1999 minimum wage introduction in the United Kingdom on the working hours for low-wage workers using difference-in-differences estimates from the individual level panel data sets. The "treatment" group was constructed using the group of individuals paid below the minimum wage level before the minimum wage introduction (directly affected by the minimum wage introduction), while the "control" group was the group of individuals already paid above the minimum wage level before the minimum wage introduction. Srtewart and Swaffield (2008) focused on two different hours of work measures, including basic paid working hours (before overtime hours) and total paid working hours (after overtime hours). The result showed that the introduction of minimum wage generally reduced basic and total paid working hours for both male and female low-wage workers by between 1 and 2 hours per week. In addition, similar to Neumark et al (2004), the lagged effects were found to be stronger than the initial effects for both basic and total paid working hours.

A few studies have examined the effects of minimum wage on the relative use of full-time and part-time employment. One of the earliest studies of the effects of minimum wage on the shift between full-time and part-time employment is the study conducted by Gramlich (1976) by using the quarterly time series data of the United States from 1963 to 1975. He found that an increase in the minimum wage reduced full-time employment and substituted part-time employment, particularly for teenage and adult male workers. For adult male workers, Gramlich (1976) argued that the result might be downward biased because the value of leisure time was not taken into account in this study. In contrast, there was no tendency towards substitution away from full-time employment into part-time employment for adult female workers, suggesting that they clearly benefited from an increase in minimum wage.

In the more recent study, Ressler et al (1996) investigated the effect of minimum wage on the part-time/full-time employment ratio using the annual time series data of the United States from 1950 to 1987. Similar to Gramlich (1976), Ressler et al (1996) found that an increase in minimum wage induced employers to substitute more part-time workers for full-time workers. Unlike Gramlich (1976), they argued that the reason was because of the spillover effects of minimum wage to the fringe benefits costs and training costs for full-time workers, suggesting a potential increase in the fixed employment costs to hire more full-time workers. In practice, Neumark et al (2004) pointed out that the substitution from full-time employment into part-time employment was in line with a decrease in hours worked.

In contrast to developed countries studies, there are an extremely limited number of publications in examining the effect of minimum wage on hours worked in developing countries. However, there have been some studies conducted in Latin-America that have used hours worked per worker as an alternative measure of the effect of minimum wage on employment, such as El-Hamidi and Terrell (2002) and Gindling and Terrell (2007) for Costa Rica, and Lemos (2004d) for Brazil. As mentioned in the previous chapter, the main difference between minimum wage implementation in developed and developing countries is the fact that the degree of compliance with minimum wage policy is relatively lower in developing countries, given the lack of enforcement and the greater proportion of the informal uncovered sector employment.

El-Hamidi and Terrell (2002) estimated the effect of the Costa Rican industrial minimum wage on employment using industrial panel data for the covered and uncovered sectors from 1980 to 1992. In Costa Rica, the minimum wage is set differently across occupations and skill-levels, providing more variation in minimum wage level. Two different measures of employment were used as dependent variables. Those were log of total number of workers employed and log of hours worked in the average week. Specifically, El-Hamidi and Terrell (2002) found that the minimum wage was positively associated with hours worked particularly when toughness (the ratio of minimum wage to the average wage) was low, indicating the presence of monopsony power in the labour market. However, a minimum wage increase was negatively associated with hours worked when minimum wage reached 66%-71% of the average wage (when toughness was high). The result suggests that an increase in minimum wage by 1% reduced hours worked of covered sector employment by 0.2% when toughness was high. In addition, El-Hamidi and Terrell (2002) also found that there was a significant positive effect of minimum wage on hours worked of workers in the uncovered sector. The result showed that an increase in minimum wage by 1% increased uncovered sector employment (i.e. self-employment) by 1.2%.

Contrary to the previous Costa Rican study, Gindling and Terrell (2007) found different results using individual pooled cross-section data from 1988 to 2000. They found that an increase in minimum wage reduced the average number of hours worked by 0.062% in the covered sector. The result confirmed that employers respond to an increase in the minimum wage by reducing the number of hours worked as well as the number of workers. However, they found that there was no significant effect of minimum wage on hours of work of workers in the uncovered sector. In addition, Gindling and Terrell (2007) extended the analysis by asking how minimum wage affects hours worked throughout the wage distribution. They found that an increase in minimum wage reduced hours worked only at the bottom half of the skills distribution, where the largest effect was found in the 2nd skill deciles of the distribution. In conclusion, Gindling and Terrell (2007) confirmed that the employment effect is larger than the hours effect, indicating that employers are more likely to adjust their number of workers' than their workers hours worked in the short run in response to minimum wage increases.

Table 7.4 summarises the estimated effects of minimum wage on hours worked in the literature. Previous studies generally showed two different ways that the minimum wage can affect hours worked. Firstly, a higher minimum wage might lead to a decrease in hours worked. This evidence supports the standard competitive model that an increase in the minimum wage reduces the quantity of labour demanded, implying that hours demanded also fall, particularly in the short run. This evidence also suggests that the effects of the minimum wage on hours worked are dominated by the scale effect rather than the substitution effect. Moreover, from the supply-side, as pointed out by Zavodny (2000), workers who earned a higher wage because of an increase in minimum wage might also want to reduce their hours worked, indicating a combination of income and substitution effects. However, in contrast to Zavodny (2000), full-time workers in Indonesia are unlikely to move to part-time employment because part-time employment is usually not covered by a permanent contract and do not receive any benefits, such as job security, health insurance, and old-age pensions from employers.

Secondly, an increase in the minimum wage might lead to an increase in hours worked. The main argument behind this evidence is that employers might substitute their high-skilled workers hours worked for less-skilled workers hours worked, confirming the presence of a substitution effect. The other reason is the monopsony present in their labour market that increases their employment, as well as their hours worked.

Comparing this chapter to the previous minimum wage studies, firstly, the minimum wage in Indonesia is set based on a monthly term, while the minimum wages in most of the other countries are set based on hourly terms. Therefore, it might be expected that the hours worked will be more sensitive to a change in minimum wage in the countries where the minimum wage is set based on an hourly term rather than in Indonesia where the monthly minimum wage exists. Secondly, this chapter extends the previous minimum wage studies in developing countries by employing the sample selection corrections based on the multinomial logit model. As mentioned above, this is important to control for the potential selection bias arising from the correlation between the unobserved factors that affect the choice of employment categories (i.e. covered and uncovered sectors) and the unobserved factors that affect their hours worked. For developing countries, the choice of employment categories is important for discussion, given a high proportion of workers in the uncovered sector. As far as we know, none of the previous minimum wage studies particularly in developing countries are concerned with this selection bias issue. Thirdly, similar to the previous chapter, the effect of minimum wage on hours worked will be discussed separately across individuals in different groups of workers, in terms of gender (male-female workers) and their residences (urban-rural areas) because they have different labour market characteristics. Gindling and Terrell (2007), for example, discussed only separately across workers in covered and uncovered sectors, but not separately across gender (male and female workers) and their residences (urban and rural areas).

Table 7.4 Previous Studies on the Effects of Minimum Wages on Hours of Work

Country/Author	Method	Minimum Wage Measure	Result
Developed Countries:			
United States: Zucker (1973)	(1) Individual panel data (2) Structural equations: 2SLS	ln (1-MW/Wage$_{-1}$)	An increase in the minimum wage **reduced** both the number of workers and the average weekly hours with the long-run elasticities of -0.79 for number employed and -0.91 for the hours worked.
Unted States: Couch & Wittenburg (2001)	OLS; Fixed effect for each state-month	Log of state minimum wage	An increase in the state minimum wage level **reduced** the average hours of work with an elasticity of -0.48
United States: Zavodny (2000)	OLS; State level and individual panel data	(1). Log of state minimum wage (deflated using PCE index or the relative minimum wage) (2). Wage gap for affected teens worker	An increase in the minimum wage was **positively** associated with the teens average hours worked.
United States: Neumark et al (2004)	OLS; Fixed effect for each state-year	$\left[\dfrac{mw_t - mw_{t-1}}{mw_{t-1}}\right]$ for each worker's group position in the wage distribution	An increase in the minimum wage **reduced** the hours worked for those who are initially paid at around the minimum wage level (low-wage worker). On the other hand, hours worked were shown to **increase** for those who are initially paid above the minimum wage level (high-wage worker).
United Kingdom: Dickens et al (1999)	Industrial Panel Data estimates	Toughness	**Positive** effects across measures and specifications
United Kingdom: Machin et al (2003)	Reduced-form model regression (using Instrumental Var.)	(1) Proportion of workers paid below the MW level (2) Wage Gap	The introduction of the minimum wage led to a **reduction** in both number employed and total hours of work of the residential care home sector employment, with elasticities between -0.14 and -0.39.
United Kingdom: Stewart & Swaffield (2004)	Difference-in-difference estimates	Individuals who earn below the minimum wage level at the time of the minimum wage introduction	The introduction of the minimum wage **reduced** the paid working hours for both male and female low wage workers.
Developing Countries :			
Costa Rica: El-Hamidi & Terrell (2002)	Industrial Panel Data estimates	Toughness	An increase in the minimum wage was associated with an **increase** in both number employed and hours worked in the covered sectors, indicating the existence of monopsony. There was also a significant **positive** effect on the hours worked in the uncovered sector.
Costa Rica: Gindling & Terrell (2007)	OLS	Log of real minimum wage	An increase in the minimum wage **reduced** the average number of hours worked by 0.062% in the covered sectors. There was no significant effect on the hours worked in the uncovered sector.
Colombia: Arango & Pachon (2004)	OLS	Ratio of the minimum wage to median income	An increase in the minimum wage **reduced** the number of hours worked of the household heads and non-head members, being stronger for household heads.
Brazil: Lemos (2004d)	Regional Panel Data estimates	Log of Real Minimum Wage, Toughness, Fraction Affected, Fraction At, and Fraction Below	An increase in the minimum wage by 10% decreased the employment rate (jobs effect) by 0.001% but **increased** the hours worked (hours effect) by 0.059%, suggesting an increase in total employment (man-hours) in short run. In the long run, an increase in the minimum wage **reduced** e total employment (man-hours) across all estimates, but the hours effect was still positive.

7.5. Research Methodology

The effects of changes in minimum wage on hours worked will be estimated particularly for paid employment in both urban and rural areas using the individual level panel data set. As mentioned above, there is a potential problem relating to the appropriate specification in this hours worked estimation. In practice, individuals selected in the sample might select themselves (self-selection) into an employment sector (or category) where they have a preference depending on their potential hours worked, suggesting that they are likely to be non-random samples from the population. Specifically, individuals who expect fixed (or standard) working hours might select themselves into the paid employment category, while individuals who expect more flexible working hours might put themselves into the self-employed and unpaid family workers categories. As a result, the choice of employment sectors (for instance, paid employment in the covered sector or self-employed and unpaid family worker in the uncovered sector) tends to be closely related with their hours of work. This implies that the unobserved factors which affect the choice of employment sectors (covered or uncovered sectors) are also likely to be correlated with the unobserved factors in the hours worked equation, suggesting a potential sample selection bias in the Ordinary Least Square (OLS) estimator.

To control for a potential sample selection bias, two-step procedure of selection biased corrections will be employed when estimating the effects of minimum wage on hours worked in Indonesia. This study presents the comparison of the estimates from two methods to correct for selection bias based on the multinomial logit model, including Lee's (1983) and Bourguignon et al's (2007) methods. This comparison is important in order to obtain the most robust estimates of the effects of minimum wage on hours worked in Indonesia. For comparison purpose, the hours worked equation will also be estimated using OLS (without correction process).

In general, following Lee (1983) and Bourguignon et al (2007), the two-step procedure of selection biased corrections are as follow:

$$y_s^* = z\gamma_s + \eta_s; \qquad s = 1, 2, 3, 4, \tag{7.16}$$

$$h_j = x\beta_j + \mu_j; \qquad j = 3 = paid\ employment \tag{7.17}$$

In the first equation (first-stage of estimation), y_s^* is a latent dependent variable representing four different employment categories, including *(1)* self-employed, *(2)* unpaid family worker, *(3)* paid employment, and *(4)* unemployed. Therefore, s is a categorical variable, indicating the selection process between these four different employment categories. The multinomial logit model of these four categories of employment will be estimated in order to obtain the predicted values used to generate the selectivity term(s) associated with each employment categories. This selection term(s) will then be used as an additional explanatory variable(s) in the hours worked equation (second-stage of estimation). Specifically, in equation 7.17 (second-stage of estimation), h is the hours worked variable (as the outcome variable) examined for paid employment in the covered sector category. On the right-hand-side of the equations, z and x are a set of the explanatory variables, while η and μ are the error terms. Further detail about the difference between Lee's and Bourguignon et al's methods will be presented in section 7.5.1 and 7.5.2.

As indicated in Bourguignon et al (2007), a general expression for the conditional probabilities of each employment category that will be used to generate the selection term(s) associated with each employment category in the first-stage of estimation is given by:

$$P_s = \frac{\exp(z\gamma_j)}{\sum_{k=0}^{3} \exp(z\gamma_s)} \tag{7.18}$$

where the explanatory variables (z) used in the multinomial logit model are:

- log of real provincial minimum wage;
- gender (female is the reference group),
- a set of age group (>=50 years old is the reference group),
- a set of marital status (singles are the reference group),
- a set of highest education completed (not finished primary school yet or never been in school is the reference group),
- a set of provincial dummy variables (West Java is the reference group),
- a set of year dummy variables (1996 is the reference group).
- a set of family background variables, including head of household (not head of household is the reference group) and number of children in the household (no children is the reference group).

Relating to the explanatory variables, as pointed out by Zhang (2004), Asadullah (2006) and Ewoudou and Vencatachellum (2006), the identifying variables (at least one variable) that are likely to affect the employment sector choices (in the first-stage of estimation) but unlikely to affect the outcome variable (hours worked in the second-stage of estimation) are necessarily needed to identify the selection term(s). Otherwise, the selection biased corrections will provide similar results to OLS (see Ewoudou and Vencatachellum, 2006). In practice, it is relatively difficult to find good identifying variables in this study because there is a close relationship between the employment categories and their hours worked. In other words, most of the observable and the unobserved variables that affect the employment categories are also predicted to affect their hours worked.

As suggested by Purwaningsih and Murtiningsih's (2006) study of Central Java in Indonesia, dummy variables of highest education completed are suitable to be employed as the identifying variables for selection equation purposes (first-stage of estimation). As pointed out by Purwaningsih and Murtiningsih (2006), the individuals' hours worked will not be affected by the levels of education as workers tend to work similar hours regardless their levels of education. In other words, there is no significant difference in terms of hours worked between workers with a higher level of education and workers with a lower level of education. However, levels of education are likely to substantially affect the employment categories. In practice, higher levels of education are expected to increase the probability of being in paid employment, while lower levels of education are predicted to increase the probability of being self-employed and an unpaid family worker in the uncovered sector.

Looking at the correlation coefficients, levels of education have higher correlations with the employment categories than the hours worked across gender (male and female workers) and their residences (urban and rural areas) (see table 7.5). Compared to the other identifying variable candidates, such as marital status, number of children in the household, or family background variable (head or non head of household), levels of education also have lower correlations with the hours worked. Therefore, we argue that levels of education will be the most appropriate as the identifying variables in the selection equation of the hours worked estimation using our labour force survey data. In this case, highest education completed are divided into six education categories including (a) university, (b) academy (vocational education), (c) senior high school, (d) junior high school, (e) primary school, (f) not finished primary school (as a reference variable).

Table 7.5 Correlation Coefficients between Levels of Education and Employment Categories/Hours Worked (Pooled Data 1996-2003)

	Primary School	Junior High School	Senior High School	Academy	University
Employment:					
Urban Areas – Males	0.1769	0.0359	0.2197	0.0938	0.1252
Urban Areas – Females	0.1926	0.0340	0.2879	0.1388	0.1599
Rural Areas – Males	0.0733	0.0717	0.2121	0.1093	0.0962
Rural Areas - Females	0.0401	0.0717	0.2340	0.1235	0.0961
Hours Worked:					
Urban Areas – Males	0.0202	0.0418	0.0376	0.0387	0.0482
Urban Areas – Females	0.0084	0.0131	0.0673	0.0059	0.0060
Rural Areas – Males	0.0319	0.0121	0.0502	0.0008	0.0027
Rural Areas - Females	0.0094	0.0186	0.0814	0.0403	0.0174

Source: Calculated from Sakernas

As noted above, two different methods to correct for selection bias based on multinomial logit model, including Lee's and Bourguignon et al's methods will be employed. Specifically, these two different correction methods are as follows.

7.5.1. Lee's Method

Lee (1983) extends the traditional Heckman's (1979) selection biased correction using the multinomial logit model (with more than two choices) in the selection equation. As pointed out by Trost and Lee (1984) and Bourguignon et al (2007), Lee's method assumes that the error terms in the selection equations and the error term in the outcome equation are jointly normally distributed. Based on this assumption, specifically, the consistent estimator (β_j) in the hours worked equation will be obtained by estimating the following equation in the second-stage of estimation:

$$h_j = x\beta_j - \left(\frac{\phi\left[\Phi^{-1}P_s\right]}{(P_s)}\right)\beta_j^* + \mu_j \qquad ; \qquad \text{for } j=3 \qquad (7.19)$$

$\frac{\phi\left[\Phi^{-1}P_s\right]}{(P_s)}$ is the selection term generated using Lee's method, where Φ is the standard normal probability density function, ϕ is the standard normal cumulative distribution function, and P_s is the conditional probabilities of each employment category (see equation 7.18). Therefore, Lee's selection term is equivalent to Heckman's inverse Mills ratio which is defined as the ratio between standard normal probability density function and standard normal cumulative distributive function (Hilmer, 2001 and Zhang, 2004). As a consequence the selection term for individuals self-selecting into j employment category is negative (see equation 7.19). This implies that the interpretation is different (reverse) to the common coefficients (see Hilmer, 2001 and Zhang, 2004). For instance, a negative selection term therefore indicates a positive selection effect, implying that individuals selected into the sample are likely to work more hours than individuals randomly selected from the population. On the other side, a positive estimate indicates a negative selection effect, suggesting that individuals selected into the sample are likely to work fewer hours than individuals randomly selected from the population.

Using the Monte Carlo simulation, Bourguignon et al (2007) indicated that there are at least two main limitations of Lee's correction method. Firstly, because Lee's method assumes that the error terms are jointly normally distributed, this implies that the estimator will be robust when the correlations between the unobserved factors that make one more likely to choose one employment sector choice against any other employment sector choices and the unobserved factors in the outcome equation (hours worked equation) are identical with the same sign or direction. In other words, the estimator is likely to be biased when the correlations among the unobserved factors have opposite (or different) direction. In practice, it is not clear whether the unobserved factors that make one more likely to choose paid employment against any other employment sector choices are correlated in the same sign or direction with the unobserved factors in hours worked equation. Secondly, using Monte Carlo experiments, Bourguignon et al (2007) also indicated that Lee's method is robust only in the case of small samples. Using relatively big samples, Lee's method tends to provide inconsistent results, particularly compared to Dubin and McFadden's method using more than one parameter in the selection term.

7.5.2. Bourguignon et al's method

As an alternative, Bourguignon et al's method will be employed in order to correct for a potential selection bias[49]. Bourguignon et al's method is actually a modification of Durbin and McFadden's (1984) correction method, suggesting a set of normal distributions in the error terms, both in the selection and the outcome equation. Moreover, it is assumed that there is a linear correlation between the normalized error terms in the selection equation and the normalized error term in the outcome equation (see Bourguignon et al, 2007). In contrast to Lee's method, both Bourguignon et al's and Dubin and McFadden's method estimates all correlation patterns between the error term for each employment sector choices in the multinomial logit model and the error term in the outcome equation. Therefore, the number of selection terms will be equal to the number of employment sector choices from the first-stage estimation (Dimova and Gang, 2007). In contrast, Lee's method provides only one choice

[49] It is estimated using the command selmlog (dmf2) in the statistical program STATA.

parameter of selection term, assuming that all of the error terms are jointly normally distributed.

Specifically, following Bourguignon et al (2007), the hours worked equation in the second-stage of estimation is as follows:

$$h_j = x\beta_j + r_j^* m(P_j) + \sum_{j=4} r_j^* m(P_j) \frac{P_j}{(P_j - 1)} + \mu_{it} \qquad (7.20)$$

where r_j* is the correlation between the error term in the hours worked equation and the normalized error term in the selection equation for all of the employment sector choices, while P_j is the probability that a category j is selected and $m(P_j)$ is the fitted probabilities of multinomial logit model in the first-stage estimation.

Using the Monte Carlo experiment, Bourguignon et al (2007) indicated that their method is generally robust across different sample sizes and different number of choices designs compared to Lee's method. Moreover, Bourguignon et al (2007) indicated that their method is superior to the other methods particularly when normality is needed in the outcome equation. In addition, as pointed out by Dimova and Gang (2007), using Bourguignon et al's method, we can identify which employment category in the samples causes the selection bias. Although Lee's method tells us whether the direction of sample selection bias is positive or negative, it is not clear which employment category causes the selection bias in the estimation.

Compared to Lee's method, the interpretation of selection terms is relatively straightforward. In other words, a positive estimate indicates a positive selection effect, while a negative estimate indicates a negative selection effect. Specifically, as suggested by Dimova and Gang (2007), a negative coefficient in the outcome equation therefore would mean that individuals in a specific sector are likely to work fewer hours than a random set of comparable individuals in the population because individuals with worse (less suitable) unobserved characteristics have allocated themselves into this sector out of an alternative one, or because individuals with better (more suitable) unobserved characteristics have allocated themselves elsewhere from this sector. On the other side, a positive coefficient in the outcome equation would mean that individuals in a specific sector are likely to work more hours than a random set of comparable individuals in the population because individuals with better (more suitable) unobserved characteristics have allocated themselves into this sector out of an alternative one (see Dimova and Gang, 2007 for a further example of interpretation of Bourguignon et al's method).

Using both Lee's and Bourguignon et al's method, two additional explanatory variables will be added in the hours worked equation (as second-stage estimation). Two additional explanatory variables in the hours worked equation are as follows:

- a set of sectoral activities of individual jobs (the agriculture sector is the reference group).
- the provincial unemployment rate correlated with individual residence in the survey.

All of the hours worked equations will be estimated separately for male and female workers in the urban and rural areas. This is important in order to capture any differences due to the possibility that they might behave differently as minimum wage increases.

7.6. Data Sources

Similar to the previous chapter, the main source of the individual level data set used in this study is the Indonesian Labour Force Survey (the so-called Sakernas) for the years 1996-2003. The individuals (aged>15) included in the sample are those who held one of the primary activities as follows: self employed, unpaid family worker, paid employment and unemployed. Following the same definition as the previous section, paid employment is the category of employment that is legally covered by minimum wage, while self-employed and unpaid family workers are categorized as employment in the uncovered sector.

Individuals who reported that their primary activity is a student, a housewife (or a house-husband), or those with a major activity "other" than working at least one hour during the week prior to the survey were excluded from the sample. Unemployed or discouraged workers who were not willing to work were also excluded from the sample, suggesting that they were not in the labour force. As a result, about 35% of the Labour Force Survey samples were not used in this study because they were not in the labour force.

The sample means in the selection equation (first-stage estimation) are presented in table 6.4 in the previous chapter as we used the same sample as the previous chapter. Regarding to the outcome equation (second-stage of estimation), this study focuses specifically on paid employment as the category of employment legally covered by minimum wage, consisting of 129,883 workers in urban areas and 99,703 workers in rural areas. A high proportion of paid employment in urban areas confirms that workers in urban areas are predominantly in the paid employment category and therefore legally covered by the minimum wage policy, while in contrast, low proportion of paid employment in rural areas indicates that workers in rural areas are dominated by workers in the uncovered sectors.

In terms of hours worked, individuals reported total hours worked in their primary activity on a daily and weekly basis during the week prior to the labour force survey. Following the previous studies (see for example Zavodny, 2000 and Gindling and Terrell, 2007), this study uses hours worked per week as a common unit of the hours worked variable rather than hours worked per day. All observations that reported zero or missing hours worked are excluded from the sample. Moreover, as mentioned before, the samples are divided into several groups of workers, including gender (males and females) and their residence (urban and rural areas).

In addition, similar to previous chapters, minimum wage data used in this study is the regional monthly minimum wage level obtained from the Department of Manpower and Central Bureau of Statistics (CBS) weighted by the provincial consumer price index (CPI). Finally, the provincial unemployment rate is obtained from the CBS publication.

Table 7.6 presents the sample means of paid employment for both males and females, as well as in both urban and rural areas. As indicated in table 7.6, in terms of marital status, in urban areas, the proportion of married women (46.2%) is lower than the proportion of married men (72.2%) due to the possible higher commitment for female workers with their household responsibilities. However, the proportion of married women in rural areas (61.2%) is relatively higher due to a higher possibility of working part-time, particularly in the agriculture sector.

Table 7.6 Sample Means (Pooled Data 1996-2003)

	Urban			Rural		
	Male	Female	Total	Male	Female	Total
Marital Status:						
Married	0.722	0.462	0.638	0.745	0.612	0.707
Separated	0.015	0.089	0.039	0.021	0.148	0.057
Single	0.263	0.449	0.323	0.234	0.24	0.236
Education:						
Below Primary	0.098	0.054	0.069	0.149	0.242	0.174
Primary	0.180	0.191	0.184	0.381	0.325	0.365
Junior H.S.	0.138	0.178	0.165	0.174	0.104	0.154
Senior H.S.	0.437	0.394	0.423	0.211	0.201	0.209
Academy	0.056	0.093	0.068	0.031	0.052	0.037
University	0.091	0.090	0.091	0.054	0.076	0.061
Age:						
age15-24	0.169	0.339	0.224	0.217	0.264	0.231
age25-34	0.344	0.334	0.341	0.313	0.289	0.306
age35-50	0.369	0.259	0.333	0.351	0.318	0.342
Age >50	0.118	0.068	0.102	0.119	0.129	0.121
Sector of Activities:						
Agriculture	0.049	0.042	0.045	0.304	0.404	0.331
Mining	0.015	0.003	0.011	0.025	0.006	0.02
Industry	0.213	0.244	0.223	0.156	0.214	0.173
Electricity	0.009	0.002	0.007	0.004	0.001	0.003
Construction	0.114	0.012	0.082	0.167	0.014	0.123
Trade	0.141	0.168	0.150	0.043	0.050	0.045
Transportation	0.085	0.018	0.064	0.059	0.005	0.044
Finance	0.03	0.029	0.029	0.007	0.006	0.007
Services	0.344	0.482	0.389	0.235	0.300	0.254

Source: Calculated from Sakernas

In terms of levels of education, the modal education category of a worker in urban areas is senior high school qualification (42.3%), while in rural areas the modal education category of a worker is primary school qualification (36.5%). Relating to the age groups, the proportion of workers increases as age increases but it will decline among the older groups of workers, indicating an inverted U-shaped relationship. Finally, in terms of sector of activities, the employment proportions of workers in urban areas are services (39%) and manufacturing sectors (22%), while the employment proportions of workers in rural areas are the agriculture (33%) and service sector (25%).

7.7. Empirical Results

7.7.1. Paid Employment in Urban Areas

This section discusses the empirical results of the effects of changes in the minimum wage on hours worked of paid employment in urban areas. Following the same classification as defined in the previous chapter, paid employment is classified as the category of employment legally covered by the minimum wage policy, while self-employed and unpaid family workers are classified as workers employed in the uncovered sector. As mentioned in the previous chapter, although paid employment is the category of employment legally covered by the minimum wage policy, there is a high proportion of paid employment which earns a wage below the minimum wage level. In this section, the effects of changes in minimum wage on overall paid employment are examined, while in the next section the effects of the minimum wage on hours worked of paid employment in the covered sector will specifically be discussed.

As mentioned above, in practice individuals might select themselves (self-selection) into an employment category (such as paid employment or self-employed) depending on their potential hours worked preference, suggesting the presence of sample selection bias. As discussed in the research methodology section, if there is a correlation between the unobserved characteristics which affect the employment categories (i.e. paid employment in the covered sector or self-employed and unpaid family workers in the uncovered sector) and the unobserved characteristics which affect their hours worked, then Ordinary Least Square (OLS) estimation is likely to be biased. Therefore, the selection biased corrections are required to provide consistent and efficient estimates.

Table 7.7 Employment Equation in Urban Areas, Males (First-stage Estimation)

	Self-Employed		Unpaid Family Worker		Paid Employment		Unemployed	
	M.E.	P value	M.E.	P value	M.E.	P value	M.E.	P value
Lrealmw	0.0220	0.036	0.0071	0.163	-0.0169	0.139	-0.0122	0.041
Married	0.1049	0.000	-0.0142	0.000	-0.0195	0.001	-0.0712	0.000
Separated	0.1257	0.000	-0.0157	0.000	-0.0788	0.000	-0.0311	0.000
Primary	-0.0463	0.000	-0.0061	0.002	0.0581	0.000	-0.0057	0.135
Junior H.S.	-0.1088	0.000	-0.0061	0.002	0.1086	0.000	0.0063	0.113
Senior H.S.	-0.2532	0.000	-0.0217	0.000	0.2320	0.000	0.0429	0.000
Academy	-0.3098	0.000	-0.0310	0.000	0.3135	0.000	0.0274	0.000
University	-0.3214	0.000	-0.0300	0.000	0.3074	0.000	0.0440	0.000
age15-24	-0.1482	0.000	-0.0244	0.000	0.1405	0.000	0.0321	0.000
age25-34	-0.0770	0.000	-0.0349	0.000	0.1256	0.000	-0.0136	0.001
age35-50	-0.0677	0.000	-0.0298	0.000	0.1238	0.000	-0.0263	0.000
Head of HH	0.1053	0.000	-0.0863	0.000	0.0658	0.000	-0.0847	0.000
1 child	-0.0153	0.000	-0.0002	0.875	0.0206	0.000	-0.0051	0.004
>=2 children	-0.0019	0.577	-0.0020	0.196	0.0100	0.009	-0.0061	0.004
Year 1997	0.0014	0.738	0.0054	0.008	-0.0031	0.502	-0.0037	0.143
Year 1998	0.0247	0.000	0.0125	0.000	-0.0505	0.000	0.0133	0.000
Year 1999	0.0263	0.000	0.0095	0.002	-0.0631	0.000	0.0274	0.000
Year 2000	0.0348	0.000	0.0122	0.000	-0.0698	0.000	0.0228	0.000
Year 2001	0.0015	0.772	0.0080	0.002	-0.0199	0.000	0.0104	0.001
Year 2002	0.0074	0.068	-0.0003	0.895	-0.0318	0.000	0.0246	0.000
Year 2003	0.0170	0.000	0.0009	0.653	-0.0422	0.000	0.0243	0.000

Note: All regressions include province dummies. Estimated by Multinomial Logit.
Number of obs = 175245
Wald chi2(135) = 31250.78
Prob > chi2 = 0
Pseudo R2 = 0.1776

Table 7.7 presents the first-stage estimation of multinomial logit selection model for male workers. The results are exactly the same as for the multinomial logit estimation developed in the previous chapter using four different employment categories, including self-employed, paid employment, unpaid family workers and unemployed (see table 6.15 in chapter 6). As discussed in the previous chapter, both the Wald test for pooling states over the multinomial logit estimate and the Small-Hsiao test for the Independence of Irrelevant Alternatives (IIA) assumption suggest that the multinomial logit estimate using four different employment categories is appropriate (see tables 6.13 and 6.14 in chapter 6). Similar to the previous chapter, the marginal effects are used to interpret the first-stage of estimation analysis due to the fact that the interpretation of the raw regression coefficients is not directly informative and comparable within different categories.

As presented in table 7.7, an increase in the minimum wage increases the probability of being self-employed (marginal effect is 0.022) and decreases the probability of being unemployed (marginal effect is 0.012) for male workers. A potential explanation of a decrease in the probability of being unemployed is that there are no social benefits provided by the government to being unemployed in Indonesia. Moreover, the effect of the minimum wage on the probability of being in paid employed for male workers is negative but the coefficient is not significantly different from zero[50].

The identifying variables (the levels of education) are significant in explaining each category of employment. This result indicates that the levels of education are suitable as the identifying variables due to the fact that they are strongly correlated to the employment categories. In terms of paid employment, men with higher education are more likely to be in the paid employed category. This effect is reflected by an increase in the marginal effect in the paid employed category from 0.058 for primary school graduates to 0.307 for university graduates, relative to the reference group (paid

[50] More detail about the interpretation of the explanatory variables is presented in the previous chapter.

employed who have not finished primary school or have never been in school). In contrast, men with higher education are less likely to be employed as unpaid family workers and less likely to be self-employed. These effects are reflected by the negative coefficients in both unpaid family worker and self-employed categories. In addition, it is interesting to note that there is a greater probability for men with higher education to be unemployed. This result is consistent with Feridhanusetyawan and Gaduh's (2000) analysis that in the absence of employment benefits provided by the government, only individuals who have higher family incomes (usually with a high education level) might remain unemployed in search of better-paid jobs.

In the second-stage of estimation, using the procedure presented in the research methodology section, the selection term(s) obtained from the first-stage of estimation is included in the paid employment hours worked equation in order to correct for potential selection bias. As mentioned before, two different methods to correct for selection bias based on multinomial logit, including Lee's and Bourguignon et al's methods are employed. The first column of table 7.8 presents the hours worked estimation for male paid employment in urban areas using Lee's method. As indicated in the first column, the sample selection term is negative and significantly different from zero, suggesting evidence of a positive selection effect in the male paid employment hours worked equation[51]. In other words, this result suggests that there is an upward bias in the hours worked equation without a correction process. However, the result from Lee's method seems to be inconsistent. As presented in the third column of table 7.8, the estimated coefficient of the minimum wage using OLS is 0.024 which is slightly lower than the estimated coefficient of the minimum wage

[51] Detail of how to interpret the selection term in Lee's method is presented in the research methodology section.

using Lee's method, indicating a downward bias (not an upward bias as predicted by Lee's method). In practice, this result is consistent with Bourguignon et al (2007) analysis that Lee's method is likely to be inconsistent and inefficient in the case of big samples. In addition, Lee's method has a very strict assumption that the unobserved factors that make one more likely to choose one employment sector choice against any other employment sector choices in the first-stage of estimation should be correlated in the same sign (direction) as the unobserved factors in the second-stage of estimation (Bourguignon et al, 2007). In practice, there is no clear indication that the unobserved factors in the employment equation has the same direction as the unobserved factors in the hours worked equation.

In order to check the robustness of the result obtained from Lee's method, as the second alternative, Bourguignon et al's selection biased correction method is estimated (see the second column of table 7.8). As indicated in the research methodology section, Bourguignon et al's method provides information on all correlation patterns or selection terms between the unobserved factors in the employment categories and the unobserved factors in the paid employment hours worked equation. Using this method, all of the selection terms are significantly different from zero, confirming that there is a strong evidence of sample selection bias in the hours worked equation for male paid employment. This evidence also suggests that the OLS estimate without selection process is not robust to provide a consistent and efficient estimate due to selection bias.

Table 7.8 Hours Worked Equation in Urban Areas, Males (Second-stage Estimation)

	Lee		Bourguignon		OLS	
	Coef.	P value	Coef.	P value	Coef.	P value
Lrealmw	0.0260	0.003	0.0270	0.002	0.0243	0.005
Married	0.0240	0.000	0.0235	0.000	0.0184	0.000
Separated	-0.0313	0.000	-0.0277	0.003	-0.0186	0.023
Head of HH	0.0092	0.006	0.0188	0.012	0.0004	0.894
1 child	0.0076	0.001	0.0084	0.000	0.0065	0.005
>=2 children	0.0038	0.141	0.0057	0.026	0.0043	0.097
Age15-24	0.0781	0.000	0.0738	0.000	0.0614	0.000
Age25-34	0.0874	0.000	0.0762	0.000	0.0581	0.000
Age35-50	0.0652	0.000	0.0591	0.000	0.0391	0.000
Industry	0.1567	0.000	0.1519	0.000	0.1413	0.000
Trade	0.2104	0.000	0.2062	0.000	0.1934	0.000
Services	0.0305	0.000	0.0281	0.000	0.0014	0.728
Mining	0.1482	0.000	0.1446	0.000	0.1310	0.000
Electricity	0.0712	0.000	0.0649	0.000	0.0455	0.000
Construction	0.1478	0.000	0.1440	0.000	0.1420	0.000
Transportation	0.2182	0.000	0.2132	0.000	0.2059	0.000
Finance	0.1080	0.000	0.1080	0.000	0.0759	0.000
Unemployment	-0.0413	0.632	-0.0324	0.706	-0.0398	0.645
Year 1997	-0.0022	0.491	-0.0015	0.648	-0.0022	0.487
Year 1998	-0.0138	0.002	-0.0137	0.003	-0.0077	0.086
Year 1999	-0.0035	0.493	-0.0046	0.372	0.0038	0.458
Year 2000	-0.0062	0.207	-0.0064	0.200	0.0024	0.629
Year 2001	-0.0022	0.620	-0.0023	0.601	-0.0012	0.778
Year 2002	-0.0150	0.000	-0.0165	0.000	-0.0123	0.003
Year 2003	-0.0044	0.297	-0.0062	0.152	-0.0005	0.915
λ1			-0.5089	0.000		
λ2			-0.2409	0.000		
λ3	-0.1010	0.000	-0.1874	0.000		
λ4			-0.4246	0.000		
Constant	3.2265	0.000	3.1167	0.000	3.3630	0.000
Observations	88828		88828		88828	
F test	189.84 (0.00)		185.102 (0.00)		183.04 (0.00)	
R squared	0.0966		0.0995		0.0918	

Note: All regressions include province dummies.
Selection term: (λ1) Self-employed, (λ2) Unpaid Family Workers, (λ3) Paid Employed, (λ4) Unemployed

The negative coefficients of the selection terms in Bourguignon et al's method mean that there are strong negative selection effects, indicating a downward bias in the OLS estimate without correction process. As suggested by Dimova and Gang (2007), any negative coefficients in the outcome equation would also mean that individuals in this sector are likely to work fewer hours than a random set of comparable individuals because individuals with less suitable unobserved characteristics have allocated into this sector out of an alternative one or because individuals with more suitable unobserved characteristics for this sector have allocated elsewhere from this sector. Specifically, a downward bias in the hours worked equation therefore means that paid employees (not randomly selected) are likely to work fewer hours than random ones from the population because of the allocation of individuals that are basically more suitable for paid employment category (based on their unobserved characteristics) into the other categories.

The strongest effect is found in the self-employed (λ_1) and unemployed (λ_4) categories, indicating that the downward selection bias is mostly caused by the allocation of individuals that are basically more suitable for paid employment category into the self-employed and unemployed categories. The potential reason for this allocation could be that they are more likely to work more flexible working hours compared to paid employees with fixed (or standard) working hours. Consistent with Bourguignon et al's method, the minimum wage coefficient using OLS without a correction process (see the third column of table 7.8) is slightly lower than Bourguignon et al's method estimate, supporting evidence of downward bias using OLS.

Using Bourguignon et al's method, most of the explanatory variables are significant at 5% level. In terms of ages, all of the coefficients are positive, implying that the younger workers (age=<50) are likely to work longer hours than older workers (age>50 or the reference group). However, the hours worked declines among older groups of workers, suggesting an inverted U-shaped relationship. For instance, young male workers (age 15-24 and age 25-34), on average, work 7.4% and 7.6% longer hours compared to the reference group (age>50), but the older male workers (age 35-50), work only 5.9% longer hours compared to the reference group.

The coefficient of marital status is significant at 5% level for male workers. The coefficient of married men is positive indicating that married men work longer hours compared to single men (the reference group). It is suggested that married men in urban areas work 2.3% longer hours compared to single men. The potential reason is that they have more responsibilities to their households encouraging them to work more hours in order to gain extra income compared to single men. Moreover, male heads of household also tend to work longer hours, compared to non-heads of household, due to their responsibilities to their households. In addition, male workers with children in their households are also likely to work more hours, compared to male workers without children in their households.

In terms of sector of activity, most of the coefficients are positive and significant at 5% level. These positive coefficients suggest that all sectors of activity are likely to work longer hours compared to the agriculture sector (the reference group), given the dominance of part-time workers in that sector. Workers in the transportation and trade sectors, which usually do not require a fixed number of hours worked, are likely to work longer hours. The result suggests that, on average, male workers in the transportation sector work 21.3% longer hours than male workers in the agriculture sector. On the other side, male workers in the finance, services, and electricity sectors tend to work fewer hours than male workers in the transportation sector, but still longer hours than male workers in the agriculture sector.

Compared to the OLS estimate (without correcting the selectivity bias), the main difference (in terms of explanatory variables) is the fact that the heads of household variable now has a positive and significant coefficient using Bourguignon et al's method, while it is not significant using the OLS estimate. Moreover, in terms of sector of activity, the service sector also has a positive and significant coefficient when corrected for selection bias using Bourguignon et al's method. In addition, based on Bourguignon et al's method, married men work many more hours compared to single men. As noted above, using Bourguignon et al's method, it is suggested that married men work 2.3% longer hours compared to single men, while using OLS, it is suggested that married men work only 1.8% more hours compared to single men.

As indicated in Bourguignon et al's result, it is suggested that an increase in minimum wage by 10% increases the average hours worked for male paid employment in urban areas by 0.27%. This evidence is generally in line with Zavodny's (2004) findings that an increase in minimum wage is predicted to decrease employment but increase hours worked of the existing workers. The potential reason is that a decrease in employment is compensated by requiring the existing workers to work longer hours when minimum wage increases (substitution effect between employment and hours worked). In addition, based on the Bourguignon et al's method estimate, this study found that there is a downward bias in the OLS estimate without correction process. It is suggested that the minimum wage coefficient in the OLS estimate is underestimated by 0.27%, compared to Bourguignon et al's method.

Table 7.9 Employment Equation in Urban Areas, Females (First-stage Estimation)

	Self-Employed		Unpaid Family Worker		Paid Employment		Unemployed	
	M.E.	P value	M.E.	P value	M.E.	P value	M.E.	P value
Lrealmw	-0.0038	0.781	0.0319	0.009	-0.0287	0.048	0.0006	0.947
Married	0.1667	0.000	0.0638	0.000	-0.1285	0.000	-0.1020	0.000
Separated	0.1483	0.000	-0.0728	0.000	-0.0708	0.000	-0.0047	0.431
Primary	0.0123	0.003	0.0025	0.537	-0.0147	0.019	0.0000	0.996
Junior H.S.	-0.0021	0.676	0.0033	0.463	-0.0223	0.001	0.0210	0.001
Senior H.S.	-0.1360	0.000	-0.0822	0.000	0.1490	0.000	0.0691	0.000
Academy	-0.2698	0.000	-0.1538	0.000	0.3789	0.000	0.0448	0.000
University	-0.2655	0.000	-0.1408	0.000	0.3062	0.000	0.1001	0.000
age15-24	-0.2401	0.000	-0.0600	0.000	0.1103	0.000	0.1899	0.000
age25-34	-0.1106	0.000	-0.0723	0.000	0.0795	0.000	0.1035	0.000
age35-50	-0.0460	0.000	-0.0552	0.000	0.0894	0.000	0.0119	0.173
Head of HH	0.2020	0.000	-0.1724	0.000	0.0440	0.000	-0.0736	0.000
1 child	0.0092	0.011	-0.0079	0.013	-0.0011	0.784	-0.0001	0.967
>=2 children	0.0146	0.001	-0.0034	0.360	-0.0091	0.059	-0.0022	0.500
Year 1997	-0.0139	0.004	0.0208	0.000	-0.0011	0.844	-0.0058	0.129
Year 1998	-0.0233	0.000	0.0406	0.000	-0.0270	0.000	0.0097	0.070
Year 1999	-0.0167	0.018	0.0336	0.000	-0.0525	0.000	0.0356	0.000
Year 2000	-0.0468	0.000	0.0559	0.000	-0.0380	0.000	0.0288	0.000
Year 2001	-0.0462	0.000	0.0396	0.000	-0.0199	0.003	0.0265	0.000
Year 2002	-0.0616	0.000	0.0329	0.000	-0.0140	0.012	0.0426	0.000
Year 2003	-0.0628	0.000	0.0430	0.000	-0.0250	0.000	0.0449	0.000

Note: All regressions include province dummies. Estimated by Multinomial Logit.
Number of obs = 104027
Wald chi2(135) = 21053.08
Prob > chi2 = 0
Pseudo R2 = 0.189

Table 7.9 presents the first-stage estimation of selection bias corrections for female paid employment in urban areas. Following the same format as the previous section, the sector of employment in the multinomial logit model is divided into four different employment categories, including self-employed, paid employment, unpaid family workers and unemployed. In practice, the result is exactly the same as table 6.16 in the previous chapter. Using the same format to the previous section, the marginal effects are used to interpret the analysis. As indicated in table 7.9, an increase in minimum wage tends to decrease the probability of being in paid employment (marginal effect is 0.029) for female workers. In contrast to male workers, an increase in the minimum wage is likely to increase the probability of women being unpaid family workers (marginal effect is 0.032). As discussed in the previous chapter, women are more likely to enter the unpaid family workers category, compared to men, because of their home-based locations and flexible working hours related to domestic tasks (Singh et al, 2004). In addition, the effects of the minimum wage on the probability of being self-employed and unemployed are not significantly different from zero.

Most of the educational attainment marginal effects are significant at 5% level, suggesting that they are appropriate as the identifying variables. Classified by the levels of education, in line with the male workers findings, an improvement in educational attainment (senior high school and university level of education) leads to an increase in the probability of being paid employed, although this effect is not clear at the lower levels of education. On the other side, the negative coefficients in both the self-employed and unpaid family worker categories suggest that the less educated workers are more likely to join these categories of employment. Moreover, similarly to male workers, an increase in educational attainment leads to an increase in the probability of being unemployed, supporting evidence that without employment benefits provided by the government, only people with higher family income (with usually a high education level) might remain unemployed.

Table 7.10 Hours Worked Equation in Urban Areas, Females (Second-stage Estimation)

	Lee		Bourguignon		OLS	
	Coef.	P value	Coef.	P value	Coef.	P value
Lrealmw	0.0369	0.026	0.0467	0.005	0.0369	0.026
Married	-0.1226	0.000	-0.1812	0.000	-0.1113	0.000
Separated	0.0196	0.020	-0.0056	0.595	0.0405	0.000
Head of HH	-0.0665	0.000	-0.0637	0.000	-0.0768	0.000
1 child	0.0146	0.001	0.0111	0.009	0.0146	0.001
>=2 children	0.0089	0.074	0.0024	0.634	0.0098	0.050
age15-24	0.1630	0.000	0.1887	0.000	0.1466	0.000
age25-34	0.0987	0.000	0.0949	0.000	0.0734	0.000
age35-50	0.0838	0.000	0.0554	0.000	0.0611	0.000
Industry	0.3677	0.000	0.3535	0.000	0.3555	0.000
Trade	0.4540	0.000	0.4542	0.000	0.4339	0.000
Services	0.2992	0.000	0.2902	0.000	0.2712	0.000
Mining	0.2792	0.000	0.2774	0.000	0.2658	0.000
Electricity	0.3617	0.000	0.3593	0.000	0.3353	0.000
Construction	0.4199	0.000	0.4315	0.000	0.4032	0.000
Transportation	0.4200	0.000	0.4238	0.000	0.3937	0.000
Finance	0.3605	0.000	0.3698	0.000	0.3278	0.000
Unemployment	0.0863	0.614	0.1438	0.397	0.0907	0.597
Year 1997	0.0084	0.157	0.0063	0.289	0.0078	0.189
Year 1998	0.0036	0.662	0.0094	0.265	0.0050	0.543
Year 1999	0.0113	0.230	0.0344	0.000	0.0152	0.107
Year 2000	0.0172	0.057	0.0330	0.001	0.0204	0.024
Year 2001	0.0046	0.575	0.0198	0.022	0.0047	0.566
Year 2002	-0.0025	0.754	0.0208	0.015	-0.0030	0.710
Year 2003	0.0105	0.200	0.0346	0.000	0.0117	0.155
λ1			-0.4624	0.000		
λ2			-0.4722	0.000		
λ3	-0.0754	0.000	-0.2479	0.000		
λ4			-0.0228	0.686		
Constant	2.8699	0.000	2.7713	0.000	2.9550	0.000
Observations	41055		41055		41055	
F test	153.99 (0.00)		158.22 (0.00)		154.01 (0.00)	
R squared	0.1581		0.1698		0.1554	

Note: All regressions include province dummies.
Selection term: (λ1) Self-employed, (λ2) Unpaid Family Workers, (λ3) Paid Employed, (λ4) Unemployed

Table 7.10 presents the second-stage estimation for female paid employment in urban areas. Similar to the previous section, for comparison purposes, Lee's and

Bourguignon et al's selection biased corrections are estimated. As presented in the first column, the selection term of Lee's method is significant at 5% level, suggesting that there is significant evidence of selection bias in the hours worked equation for female workers. The selection term is negative, indicating that there is a potential positive selection effect (or an upward bias in the OLS estimate) in the hours worked equation. In other words, this result suggests that individuals selected into the sample are likely to work more hours than individuals randomly selected from the population.

Similar to the urban areas finding for males, although the selection term is negative and significant, there is no clear evidence of upward bias in the OLS estimate without correction process (see the third column of table 7.10) suggested by the Lee's method finding. There is also no large difference between Lee's and the OLS estimate, suggesting that Lee's correction method might not necessarily be needed in examining the effects of minimum wage on hours worked.

As indicated in the previous section, Lee's method tends to be problematic in the case of big samples (see Bourguignon et al, 2007). In addition, Lee's method also has a very strict assumption that that the unobserved factors in the employment categories equation should be correlated in the same direction with the unobserved factors in the hours worked equation. Therefore, we need to interpret this carefully as Lee's method has a potential inconsistency problem in its specification particularly if its assumption does not hold. As an alternative, Bourguignon et al's method is presented in the second column of table 7.10.

As presented in the second column, most of the selection terms of Bourguignon et al's method are significant at 5% level, supporting evidence that selection biased correction is needed. In contrast to Lee's method, the selection terms of this method are significantly negative, suggesting a downward bias in the hours worked estimate using OLS without correction procedure. These negative selection effects suggest that female paid employees selected into the sample tend to work longer hours than female paid employees randomly selected from the population. This downward bias is mostly caused by the allocation of women who are basically more suitable for paid employment category into self-employed (λ_1) and unpaid family worker (λ_2) categories in the uncovered sectors.

Looking at the explanatory variables, in contrast to male workers, the coefficients of married women are negative, indicating that married women work fewer hours compared to single women (the reference group). Using Bourguignon et al's method, it is suggested that married women work 18.1% fewer hours, compared to single women. The potential reason is the fact that married women in general are more committed to their household responsibilities by working fewer hours outside their households, compared to single women. In addition, it is interesting to note that female heads of household work fewer hours compared to female non-heads of household, although the marginal effect is relatively small. The possible reason is that female heads of household are dominated by older groups of female workers.

Using Bourguignon et al's method, the effect of the minimum wage on hours worked is positive and significant at 5% level. The result indicates that, on average, a 10% increase in minimum wage increases hours worked of female paid employees in urban areas by 0.47%. By implication, an increase in hours worked of female workers indicates that there is an hours worked substitution of the existing female workers for female workers who lose their job as minimum wage increases. Moreover, the coefficient supports the Bourguignon et al's method which predicts that there is a downward bias in the OLS estimate. Using OLS, minimum wage effect is underestimated by 1% compared to Bourguignon et al's finding. In general, the result confirms that Bourguignon et al's method finding is more robust compared to Lee's method, in the case of female paid employment in urban areas.

Compared to male workers, the effects of the minimum wage on hours worked are much stronger for female workers. This evidence supports the previous finding that female workers are more likely to be affected by minimum wage. The reason is the fact that female workers, particularly in urban areas, are mostly employed in industries which contain more low-wage workers, such as in the manufacturing labour-intensive industries (Pangestu and Hendytio, 1997).

In summary, the full results of the effects of minimum wage on hours worked in urban areas reveal that hours worked increase as the minimum wage rises. Using Bourguignon et al's method, it is suggested that an increase in the minimum wage by 10% increases hours worked of male workers by 0.27% and increases hours worked of female workers by 0.47%. The result confirms that employers make an adjustment by employing their existing workers for more working hours in response to an increase in minimum wage. In other words, there is a tendency for employers to compensate for their loss of employment by requiring longer hours from the existing paid employees (substitution effect between hours worked and employment). Moreover Bourguignon et al's method tends to be more appropriate than Lee's method in explaining the effects of minimum wage on hours worked in urban areas due to the fact that Lee's method has a tendency to be inconsistent in the case of big samples. On the other hand, using OLS without accounting for selection bias, the minimum wage effect is underestimated by 0.27% for male workers and 1% for female workers.

In addition, the finding is relatively similar to that of Zavodny (2000) in the United States who found positive minimum wage effects on the hours worked. She argued that an increase in the minimum wage increased the number of hours worked because employers make adjustments by employing their high-skilled teenage employment for longer hours in order to compensate a decrease in number of low-skilled adult and teenage employment.

7.7.2 Paid Employment in Rural Areas

Extending the analysis, this study estimates the effects of changes in minimum wage on paid employment hours worked in rural areas. Compared to urban areas, the minimum wage in rural areas is less binding, particularly because of the dominance of the agriculture sector which is less likely to be covered by the minimum wage policy. Therefore, we might expect that paid employment in rural areas is less affected by a change in minimum wage. Following a similar format to the previous section, the effects of changes in minimum wage on hours worked in rural areas is estimated using the two-step procedure of selection biased corrections, including Lee's and Bourguignon et al's methods. In addition OLS estimates will be presented for comparison purposes.

Table 7.11 Employment Equation in Rural Areas, Males (First-stage Estimation)

	Self-Employed		Unpaid Family Worker		Paid Employment		Unemployed	
	M.E.	P value	M.E.	P value	M.E.	P value	M.E.	P value
Lrealmw	0.0233	0.003	0.0067	0.217	-0.0202	0.010	-0.0097	0.002
Married	0.1100	0.000	-0.0268	0.000	-0.0452	0.000	-0.0380	0.000
Separated	0.0625	0.000	-0.0120	0.000	-0.0374	0.000	-0.0131	0.000
Primary	-0.0191	0.000	-0.0038	0.023	0.0249	0.000	-0.0020	0.153
Junior H.S.	-0.0696	0.000	-0.0099	0.000	0.0677	0.000	0.0118	0.000
Senior H.S.	-0.2322	0.000	-0.0415	0.000	0.2263	0.000	0.0474	0.000
Academy	-0.5195	0.000	-0.0772	0.000	0.5473	0.000	0.0494	0.000
University	-0.4807	0.000	-0.0736	0.000	0.4828	0.000	0.0715	0.000
age15-24	-0.1902	0.000	-0.0117	0.000	0.1700	0.000	0.0318	0.000
age25-34	-0.1123	0.000	-0.0404	0.000	0.1418	0.000	0.0109	0.000
age35-50	-0.0826	0.000	-0.0439	0.000	0.1241	0.000	0.0025	0.404
Head of HH	0.2771	0.000	-0.2790	0.000	0.0326	0.000	-0.0306	0.000
1 child	-0.0121	0.000	0.0014	0.299	0.0100	0.000	0.0008	0.371
>=2 children	-0.0028	0.239	0.0007	0.622	0.0042	0.076	-0.0022	0.032
Year 1997	-0.0190	0.000	0.0075	0.000	0.0135	0.000	-0.0020	0.127
Year 1998	0.0094	0.015	0.0150	0.000	-0.0269	0.000	0.0025	0.152
Year 1999	0.0109	0.008	0.0092	0.001	-0.0330	0.000	0.0129	0.000
Year 2000	0.0123	0.001	0.0162	0.000	-0.0482	0.000	0.0197	0.000
Year 2001	-0.0196	0.000	0.0166	0.000	-0.0145	0.000	0.0175	0.000
Year 2002	-0.0200	0.000	0.0021	0.294	-0.0070	0.015	0.0249	0.000
Year 2003	-0.0166	0.000	0.0240	0.000	-0.0322	0.000	0.0249	0.000

Note: All regressions include province dummies. Estimated by Multinomial Logit.
Number of obs = 286185
Wald chi2(138) = 6873.32
Prob > chi2 = 0
Pseudo R2 = 0.2532

Table 7.11 presents the first-stage estimation of the selection biased corrections based on the multinomial logit for male workers in rural areas. More detail about this result has been discussed in the previous chapter (see table 6.21 in chapter 6). As indicated in table 7.11, an increase in minimum wage reduces the probability of being paid employed (marginal effect is 0.020). Within the uncovered sector, an increase in minimum wage leads to an increase in the probability of men being self-employed, but there is no significant effect on the probability of a man being an unpaid family worker. In addition, an increase in minimum wage is associated with a decline in the probability of being unemployed, although the effect is relatively small (marginal effect is 0.01).

Following a similar format to the previous section, levels of education are used as the identifying variables. In terms of paid employment, men with university qualifications are likely to be in paid employment. The coefficient is slightly stronger than paid employment with university qualifications in urban areas. The potential reason is that men with university qualifications are still limited in rural areas, providing a bigger probability of entering the paid employment category in rural areas than in urban areas. Moreover, similar to workers in urban areas, men with lower levels of education are more likely to be employed in the uncovered sector (as self-employed and unpaid family workers). These effects are reflected by the negative coefficients in both the unpaid family worker and self-employed categories.

Table 7.12 presents the second-stage estimation for male paid employment in rural areas. As presented in the first column, the effect of minimum wage on male paid employment hours worked is estimated using Lee's method. The selection term obtained using Lee's method is negative and significant at 5% level, suggesting that there is a positive selection effect. This positive selection effect indicates that paid employees selected in the sample are likely to work longer hours than paid employment randomly selected from the population. Compared to OLS (see the third column of table 7.12), the minimum wage coefficient is slightly lower, supporting the evidence of an upward bias in the hours worked equation using OLS as predicted by Lee's method estimate.

Table 7.12 Hours Worked Equation in Rural Areas, Males (Second-stage Estimation)

	Lee		Bourguignon		OLS	
	Coef.	P value	Coef.	P value	Coef.	P value
Lrealmw	0.0491	0.000	0.0509	0.000	0.0500	0.000
Married	0.0339	0.000	0.0292	0.000	0.0333	0.000
Separated	-0.0576	0.000	-0.0636	0.000	-0.0552	0.000
Head of HH	-0.0059	0.184	-0.0178	0.151	-0.0084	0.060
1 child	0.0070	0.018	0.0074	0.013	0.0052	0.080
>=2 children	0.0044	0.191	0.0055	0.102	0.0042	0.212
age15-24	0.0923	0.000	0.0837	0.000	0.0710	0.000
age25-34	0.1080	0.000	0.0946	0.000	0.0810	0.000
age35-50	0.0897	0.000	0.0793	0.000	0.0678	0.000
Mining	0.1547	0.000	0.1539	0.000	0.1523	0.000
Industry	0.1918	0.000	0.1903	0.000	0.1859	0.000
Electricity	0.0865	0.000	0.0837	0.000	0.0687	0.001
Construction	0.2067	0.000	0.2058	0.000	0.2048	0.000
Trade	0.2458	0.000	0.2442	0.000	0.2372	0.000
Transportation	0.2753	0.000	0.2743	0.000	0.2704	0.000
Finance	0.1537	0.000	0.1533	0.000	0.1304	0.000
Services	0.0322	0.000	0.0313	0.000	0.0076	0.028
Unemployment	-0.0881	0.461	-0.0762	0.524	-0.0886	0.459
Year 1997	0.0060	0.144	0.0065	0.116	0.0040	0.335
Year 1998	-0.0050	0.391	-0.0038	0.512	-0.0028	0.630
Year 1999	0.0067	0.311	0.0068	0.305	0.0093	0.159
Year 2000	-0.0010	0.880	-0.0001	0.990	0.0032	0.612
Year 2001	0.0028	0.629	0.0031	0.605	0.0017	0.774
Year 2002	-0.0122	0.030	-0.0138	0.016	-0.0135	0.016
Year 2003	-0.0112	0.054	-0.0100	0.103	-0.0087	0.135
λ1			-0.1910	0.000		
λ2			-0.0569	0.126		
λ3	-0.0603	0.000	-0.0062	0.532		
λ4			-0.1498	0.000		
Constant	2.8915	0.000	2.8389	0.000	2.9749	0.000
Observations	71131		71131		71131	
F test	180.68 (0.00)		171.74 (0.00)		181.13 (0.00)	
R squared	0.1128		0.1135		0.111	

Note: All regressions include province dummies.
Selection term: (λ1) Self-employed, (λ2) Unpaid Family Workers, (λ3) Paid Employed, (λ4) Unemployed

In contrast, the selection terms obtained using Bourguignon et al's method (see the second column of table 7.12) show a different result. Using this method, two of the selection terms are negative and significant indicating that there are negative selection effects. These negative selection effects suggest that paid employees in the sample work fewer hours than a random set of comparable paid employees because individuals that are basically more suited for the paid employment category (based on their unobserved characteristics) have been allocated into self-employed (λ_1) and unemployed (λ_4) categories.

Similar to urban areas, the minimum wage coefficient using Bourguignon et al's method is slightly higher compared to the OLS estimate suggesting a downward bias in the hours worked estimation without accounting for the selection process. In comparison, there is no clear justification about which method, between Lee's and Bourguignon et al's, is the more robust in the case of male paid employment in rural areas. However, we need to interpret this cautiously as Lee's method seems to have failed in the urban areas case with relatively big samples. In the previous section (urban areas), Lee's method leads to inconsistent results because the selection term shows an opposite direction to what we might expect. Therefore, in practice, we have more confidence using the Bourguignon et al's method estimate than using the Lee's method estimate.

Using Bourguignon et al's method, it is suggested that a 10% increase in the minimum wage raises the average male paid employment hours worked in rural areas by 0.51%. Using OLS without a selection process, the minimum wage effect is underestimated by 0.1% compared to Bourguignon et al's finding. In general this positive effect supports the previous findings in urban areas indicating that an increase in the minimum wage increases male paid employment hours worked. Combining the result from the previous chapter, the full results indicate that an increase in minimum wage is predicted to decrease the probability of being paid employed and is compensated for by requiring longer hours for existing paid employees in rural areas, supporting the presence of substitution effect between employment and hours worked. Compared to urban areas, the minimum wage coefficients for paid employment in rural areas are slightly higher. This feature perhaps indicates a process of structural transformation in Indonesia marked by a shift in employment from the agriculture sector to the other sectors. As discussed in the previous section, most workers in the agriculture sector tend to work fewer hours than the other sectors due to the fact that the hours worked in the agriculture sector are likely to be seasonal.

Turning to the female workers, table 7.13 presents the first-stage estimation of the selection biased corrections for female workers in rural areas. Contrary to men, there is no significant effect of minimum wage on the probability of being in paid employment, suggesting that female workers in rural areas are less affected by the minimum wage policy. On the other hand, an increase in minimum wage increases the probability of women being unpaid family workers (marginal effect is 0.037). As mentioned in the previous chapter, unpaid family work plays an important role providing an alternative job, particularly for women with young children or women with higher household responsibilities that require more flexible working hours. In addition, an increase in minimum wage decreases the probability of women being self-employed (marginal effect is -0.040).

Table 7.13 Employment Equation in Rural Areas, Females (First-stage Estimation)

	Self-Employed		Unpaid Family Worker		Paid Employment		Unemployed	
	M.E.	P value	M.E.	P value	M.E.	P value	M.E.	P value
Lrealmw	-0.0395	0.000	0.0366	0.002	0.0027	0.740	0.0002	0.967
Married	0.0853	0.000	0.0744	0.000	-0.0783	0.000	-0.0815	0.000
Separated	0.1264	0.000	-0.0871	0.000	-0.0264	0.000	-0.0129	0.000
Primary	0.0146	0.000	-0.0106	0.000	-0.0106	0.000	0.0067	0.000
Junior H.S.	0.0447	0.000	-0.0670	0.000	-0.0049	0.137	0.0272	0.000
Senior H.S.	-0.0694	0.000	-0.2352	0.000	0.2194	0.000	0.0852	0.000
Academy	-0.0335	0.442	-0.0629	0.195	0.1045	0.000	-0.0082	0.191
University	-0.2601	0.000	-0.4021	0.000	0.5357	0.000	0.1265	0.000
age15-24	-0.1449	0.000	-0.0382	0.000	0.0778	0.000	0.1052	0.000
age25-34	-0.0558	0.000	-0.0646	0.000	0.0637	0.000	0.0568	0.000
age35-50	-0.0164	0.000	-0.0580	0.000	0.0583	0.000	0.0162	0.000
Head of HH	0.4409	0.000	-0.4721	0.000	0.0673	0.000	-0.0360	0.000
1 child	0.0079	0.003	-0.0021	0.452	-0.0040	0.055	-0.0018	0.155
>=2 children	0.0031	0.369	0.0067	0.056	-0.0100	0.000	0.0002	0.885
Year 1997	-0.0434	0.000	0.0357	0.000	0.0097	0.001	-0.0020	0.293
Year 1998	-0.0505	0.000	0.0502	0.000	-0.0024	0.541	0.0028	0.285
Year 1999	-0.0499	0.000	0.0260	0.000	-0.0059	0.153	0.0297	0.000
Year 2000	-0.0863	0.000	0.0752	0.000	-0.0139	0.000	0.0251	0.000
Year 2001	-0.1085	0.000	0.0728	0.000	-0.0004	0.918	0.0362	0.000
Year 2002	-0.0719	0.000	0.0358	0.000	-0.0047	0.107	0.0408	0.000
Year 2003	-0.1286	0.000	0.0996	0.000	-0.0152	0.000	0.0442	0.000

Note: All regressions include province dummies. Estimated by Multinomial Logit.
Number of obs = 189199
Wald chi2(138) = 38851.31
Prob > chi2 = 0
Pseudo R2 = 0.1847

Following the same format as the previous section, table 7.14 presents the second-stage estimation of the selection biased corrections for female workers in rural areas. Looking at the selection terms, both Lee's and Bourguignon et al's method are significant at the 5% level. Both Lee's and Bourguignon et al's method show similar positive selection effects indicating that there is an upward bias in the hours worked estimation using OLS without selection process. More specifically, Bourguignon et al's method suggests that paid employees in the sample are likely to work more hours than a random set of paid employees in the population because individuals that are basically more suitable for paid employment categories have been allocated into unpaid family workers (λ_2) and unemployed (λ_4) categories.

Table 7.14 Hours Worked Equation in Rural Areas, Females (Second-stage Estimation)

	Lee		Bourguignon		OLS	
	Coef.	P value	Coef.	P value	Coef.	P value
Lrealmw	0.0359	0.147	0.0377	0.128	0.0328	0.186
Married	-0.1163	0.000	-0.1569	0.000	-0.1044	0.000
Separated	-0.0472	0.000	-0.0807	0.000	-0.0378	0.002
Head of HH	0.0082	0.445	-0.1031	0.001	-0.0089	0.402
1 child	-0.0119	0.047	-0.0141	0.020	-0.0111	0.065
>=2 children	-0.0151	0.038	-0.0165	0.024	-0.0121	0.096
age15-24	0.1811	0.000	0.2320	0.000	0.1642	0.000
age25-34	0.1455	0.000	0.1693	0.000	0.1202	0.000
age35-50	0.1494	0.000	0.1578	0.000	0.1279	0.000
Mining	0.2390	0.000	0.2383	0.000	0.2374	0.000
Industry	0.3204	0.000	0.3239	0.000	0.3117	0.000
Electricity	0.2924	0.001	0.3072	0.000	0.2525	0.003
Construction	0.3931	0.000	0.3949	0.000	0.3886	0.000
Trade	0.4241	0.000	0.4283	0.000	0.4062	0.000
Transportation	0.3686	0.000	0.3727	0.000	0.3490	0.000
Finance	0.2781	0.000	0.2847	0.000	0.2302	0.000
Services	0.2200	0.000	0.2272	0.000	0.1734	0.000
unemployment	0.0647	0.808	0.0748	0.778	0.0771	0.772
Year 1997	0.0045	0.597	0.0098	0.260	0.0008	0.925
Year 1998	-0.0149	0.214	-0.0091	0.453	-0.0180	0.133
Year 1999	0.0008	0.952	0.0127	0.368	-0.0019	0.890
Year 2000	0.0169	0.193	0.0361	0.010	0.0160	0.219
Year 2001	0.0518	0.000	0.0785	0.000	0.0467	0.000
Year 2002	0.0196	0.101	0.0367	0.004	0.0166	0.167
Year 2003	0.0070	0.585	0.0396	0.011	0.0070	0.589
λ1			-0.0240	0.610		
λ2			0.2259	0.000		
λ3	-0.0774	0.000	0.1303	0.000		
λ4			0.2898	0.000		
Constant	2.7727	0.000	2.8554	0.000	2.9243	0.000
Observations	28572		28572		28572	
F test	113.75 (0.00)		108.0 (0.00)		113.87 (0.00)	
R squared	0.1663		0.1672		0.1636	

Note: All regressions include province dummies.
Selection term: (λ1) Self-employed, (λ2) Unpaid Family Workers, (λ3) Paid Employed, (λ4) Unemployed

Looking at the explanatory variables, similar to female paid employment in urban areas, the coefficients of married women are negative, indicating that married women work fewer hours compared to single women (the reference group). Moreover, female heads of household also work fewer hours compared to female non-heads of household. As indicated in the previous section, the potential reason is that female heads of household are dominated by older female workers. In addition, female paid employees with children work fewer hours compared to female workers without children in their household.

In contrast to male workers, the effects of the minimum wage on female workers' hours worked are not significantly different from zero using different methods. The result is in line with the employment effect in the first-stage of estimation suggesting that there is no significant effect of the minimum wage on the probability of being in paid employment for female workers in rural areas. As mentioned in the previous chapter, female paid employees in rural areas are less affected by the minimum wage, since most of them are still paid below the minimum wage level. In addition, female workers in rural areas are also dominated by workers in the agriculture sector which is not directly affected by the minimum wage policy. Compared to female workers in urban areas, these results also indicate that the minimum wage has a stronger effect in urban areas where the minimum wage is more binding due to greater enforcement and more effective labour unions.

7.7.3 Robustness Checks

In the previous section, the effects of changes minimum wage on hours worked of overall paid employment are estimated. Although paid employment is the category of employment legally covered by the minimum wage policy, in practice there is a high proportion of paid employment which earns a wage below the minimum wage level (paid employment in the uncovered sector), given the low compliance and lack of enforcement by the government. In order to check the robustness of the results for the inclusion of paid employment in the uncovered sector, the effects of changes in the minimum wage on hours worked are re-estimated using paid employment in the covered sector data only. In other words, paid employment in the uncovered sector is excluded from the sample in the hours worked equation (second-stage estimation), although it is still used in the first-stage estimation.

In the first-stage of estimation, specifically, the multinomial logit model is extended using five different employment categories: (1) self-employed, (2) unpaid family worker, (3) paid employment in the covered sector, (4) unemployed, (5) paid employment in the uncovered sector. In practice, the results from this multinomial logit specification are exactly the same as the previous chapter discussion using five employment categories (see tables 6.19, 6.20, 6.23 and 6.24 in the previous chapter). Following the same format as the previous section, the multinomial logit model is estimated in order to provide the selection terms associated with each employment category which are used as additional explanatory variables in the hours worked equation (second-stage estimation). In the second-stage of estimation, then, the hours worked equation is estimated specifically using only data of paid employment in the covered sector category. This section continues to use Bourguignon et al's selection bias correction method given the inconsistent results of Lee's method in the previous section.

Table 7.15 presents the estimation results for the effect of minimum wage on hours worked of covered sector paid employment in urban areas. The minimum wage coefficients show consistently a positive effect on hours worked, indicating a substitution effect between employment and hours worked. Compared to the previous section estimates using overall paid employment, the coefficients are relatively high, confirming that paid employment in the covered sector is more affected by the minimum wage. Using Bourguignon et al's method, it is suggested that an increase in minimum wage by 10% increases the average hours worked of paid employment in the covered sector by 0.77% for male workers and 0.49% for female workers. Although the effects are stronger than the effects of minimum wage on hours worked of overall paid employment, the coefficients are still smaller than the coefficients of minimum wage effects on employment. In the previous chapter, using a regional panel data method, it is suggested that an increase in minimum wage by 10% decreases paid employment in the covered sector by 3.01%-4.17%. Similar to Gindling and Terrell (2007), this result indicates that hours worked is less sensitive than employment to a change in minimum wage. The potential explanation is that the minimum wage in Indonesia is set based on monthly terms (not hourly terms), suggesting a change in per-worker cost (not a change in per-hour cost). By implication, although the minimum wage effect on hours worked is positive, we predict that man-hours will still fall as a result of an increase in minimum wage.

Most of the selection terms are significant at 5% level, implying that the selection bias correction is needed. For males, the strongest selection term effect is found in paid employment in the uncovered sector category (λ5), which shows a positive effect on hours worked. This positive selection effect indicates that there is an upward bias in the OLS estimate without correction process because of the re-allocation of individuals who are more suitable for covered sector employment from paid employment in the uncovered sector category (λ5). However, this positive selection effect seems to be offset by the negative selection effects found in self-employed and unpaid family workers categories due to the fact that in practice the OLS estimate shows a downward bias compared to Bourguignon et al's method estimate (see the third column of table 7.15). This is indicated by the coefficient that is slightly lower than Bourguignon et al's method estimate.

Turning to female workers, the selection term of paid employment in the uncovered sector category (λ5) for female workers is not significantly different from zero. This result suggests that there is no significant sample selection bias because of the allocation of individuals between paid employment in the covered sector and the uncovered sector. In other words, this evidence would imply that a selection biased correction model based on multinomial logit using five different employment categories (separating paid employment in the covered and uncovered sector) is not necessarily needed because the selection bias is mostly caused by the allocation of individuals from paid employment category into self-employed, unpaid family workers, and unemployed categories (not caused by the allocation between paid employment in the covered and uncovered sectors).

Table 7.15 Hours Worked Equation for Covered Sector Employment in Urban Areas

	Bourguignon				OLS			
	Male		Female		Male		Female	
	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value
Lrealmw	0.0770	0.000	0.0492	0.009	0.0456	0.000	0.0566	0.002
Married	-0.0419	0.000	-0.1182	0.000	0.0026	0.477	-0.0568	0.000
Separated	-0.0348	0.000	-0.0256	0.024	0.0185	0.038	0.0607	0.000
Head of HH	-0.0319	0.000	-0.0252	0.131	-0.0079	0.015	-0.0397	0.000
1 child	0.0121	0.000	-0.0012	0.813	0.0078	0.001	0.0098	0.041
>=2 children	0.0118	0.000	-0.0131	0.032	0.0094	0.000	0.0054	0.350
age15-24	0.1163	0.000	0.2002	0.000	0.0598	0.000	0.1307	0.000
age25-34	0.0923	0.000	0.1604	0.000	0.0515	0.000	0.0944	0.000
age35-50	0.0577	0.000	0.0779	0.000	0.0222	0.000	0.0454	0.000
Mining	-0.0280	0.000	0.0171	0.642	-0.0568	0.000	-0.0374	0.320
Industry	-0.0358	0.000	0.0533	0.001	-0.0562	0.000	0.0277	0.094
Electricity	-0.0833	0.000	0.0452	0.240	-0.1238	0.000	-0.0287	0.466
Construction	-0.0382	0.000	0.0836	0.000	-0.0396	0.000	0.0324	0.128
Trade	0.0278	0.000	0.1308	0.000	0.0032	0.563	0.0699	0.000
Transportation	0.0611	0.000	0.1109	0.000	0.0475	0.000	0.0334	0.107
Finance	-0.0464	0.000	0.0642	0.001	-0.1068	0.000	-0.0318	0.091
Services	-0.0990	0.000	0.0109	0.504	-0.1516	0.000	-0.0756	0.000
Unemployment	0.0179	0.831	0.2240	0.221	-0.0169	0.843	0.2748	0.144
Year 1997	-0.0001	0.963	0.0095	0.152	0.0000	0.991	0.0071	0.295
Year 1998	0.0007	0.879	0.0134	0.149	0.0017	0.711	0.0130	0.159
Year 1999	0.0062	0.230	0.0063	0.566	0.0088	0.080	-0.0049	0.641
Year 2000	-0.0295	0.000	-0.0066	0.530	-0.0107	0.024	-0.0267	0.007
Year 2001	-0.0156	0.000	0.0166	0.079	-0.0142	0.001	-0.0138	0.113
Year 2002	0.0105	0.046	0.0000	0.999	-0.0159	0.000	-0.0253	0.005
Year 2003	0.0086	0.087	0.0152	0.131	-0.0105	0.014	-0.0135	0.139
λ1	-0.3134	0.000	-0.1148	0.017				
λ2	-0.1395	0.001	-0.1050	0.023				
λ3	-0.0152	0.213	0.1152	0.000				
λ4	0.0571	0.208	0.1786	0.006				
λ5	0.4306	0.000	-0.0072	0.898				
Constant	3.0092	0.000	3.0067	0.000	3.3759	0.000	3.0871	0.000
Observations	60121		18450		60121		18450	
F test	181.36 (0.00)		77.01 (0.00)		143.21 (0.00)		61.35 (0.00)	
R squared	0.1402		0.1844		0.1046		0.1404	

Note: All regressions include province dummies.
Selection term: (λ1) Self-employed, (λ2) Unpaid Family Workers, (λ3) Paid Employed in the Covered Sector (λ4) Unemployed, (λ5) Paid Employed in the Uncovered Sector

As mentioned in the previous chapter, in practice there is a potential problem in using five employment categories used in this study because paid employment in the covered sector and paid employment in the uncovered sector categories has similar observed and unobserved factors, indicating that they do not necessarily need to be separated in the multinomial logit estimation (the first-stage estimation). Although the Wald test for pooling employment categories is significant (see table 6.18 in the previous chapter), the chi-squared coefficients are relatively much lower than the chi-squared coefficients in the four employment categories specification suggesting that they are less robust than four employment categories specification.

In addition, some of the explanatory variables in the selection biased corrections model based on multinomial logit using five different employment categories also show unexpected direction (sign), suggesting the potential biased estimate. Using five different employment categories, for instance, married men and male heads of household are now negatively associated with hours worked, suggesting that they work fewer hours than single men and non-heads of household. In addition, some sectors of activity, such as electricity, finance and services sectors, have negative coefficients suggesting that workers in those sectors are likely to work fewer hours than the agriculture sector (the reference group) which does not seem relevant in our case. As a result, we might conclude that Bourguignon et al's selection biased corrections model based on multinomial logit using five different employment categories is less robust compared to Bourguignon et al's method estimates based on multinomial logit using four different employment categories. However, the minimum wage effect on hours worked remains positive and significant across different specifications, indicating that the positive effect of minimum wage is relatively strong.

Table 7.16 presents the estimation results for the hours worked equation of paid employment in the covered sector in rural areas. Consistent with the previous section finding, the coefficients of minimum wage are positively associated with hours worked. However, using Bourguignon et al's selection biased correction method, the minimum wage effect for male workers is only significant at 10% level, indicating that hours worked of male workers in rural areas is less affected by minimum wage. In contrast, the minimum wage effect for female workers is significant at 1% level. However, similar to the urban areas, the selection term of paid employment in the uncovered sector category ($\lambda 5$) is not significant. This indicates that there is no need to separate paid employment in the covered and uncovered sectors because there is no significant sample selection bias across both employment categories. This result supports the evidence in urban areas that the selection biased corrections model based on the multinomial logit model with four different employment categories is more robust than with five different employment categories.

Table 7.16 Hours Worked Equation for Covered Sector Employment in Rural Areas

	Bourguignon				OLS			
	Male		Female		Male		Female	
	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value
Lrealmw	0.0236	0.082	0.1062	0.007	0.0282	0.039	0.0949	0.013
Married	-0.0136	0.095	-0.1098	0.000	0.0054	0.307	-0.0555	0.000
Separated	-0.0293	0.017	-0.0429	0.038	-0.0094	0.422	0.0155	0.379
Head of HH	-0.0352	0.006	0.0004	0.992	-0.0058	0.204	-0.0166	0.293
1 child	0.0112	0.000	-0.0131	0.133	0.0063	0.045	-0.0093	0.289
>=2 children	0.0139	0.000	-0.0228	0.027	0.0126	0.000	-0.0170	0.104
age15-24	0.1058	0.000	0.2081	0.000	0.0562	0.000	0.1546	0.000
age25-34	0.1019	0.000	0.1810	0.000	0.0501	0.000	0.1295	0.000
age35-50	0.0668	0.000	0.1257	0.000	0.0251	0.000	0.0836	0.000
Mining	0.0234	0.004	0.0550	0.233	0.0178	0.029	0.0269	0.566
Industry	0.0147	0.001	0.0666	0.000	0.0001	0.975	0.0228	0.072
Electricity	-0.0311	0.103	0.0567	0.624	-0.0712	0.000	-0.0384	0.744
Construction	0.0212	0.000	0.0888	0.000	0.0185	0.000	0.0714	0.002
Trade	0.0797	0.000	0.1767	0.000	0.0579	0.000	0.1028	0.000
Transportation	0.1302	0.000	0.1926	0.000	0.1203	0.000	0.1249	0.002
Finance	0.0192	0.152	0.0967	0.005	-0.0393	0.003	-0.0380	0.267
Services	-0.0683	0.000	0.0210	0.153	-0.1328	0.000	-0.1107	0.000
Unemployment	-0.1649	0.168	-0.4057	0.254	-0.1966	0.105	-0.4603	0.203
Year 1997	0.0116	0.004	-0.0069	0.590	0.0064	0.119	-0.0133	0.301
Year 1998	-0.0123	0.045	0.0219	0.213	-0.0059	0.340	0.0131	0.460
Year 1999	-0.0020	0.778	0.0437	0.031	0.0066	0.347	0.0228	0.257
Year 2000	-0.0250	0.000	0.0269	0.162	-0.0129	0.042	0.0045	0.803
Year 2001	-0.0114	0.082	0.0183	0.340	-0.0274	0.000	-0.0098	0.571
Year 2002	0.0083	0.306	0.0004	0.983	-0.0120	0.052	-0.0218	0.227
Year 2003	-0.0123	0.138	-0.0079	0.725	-0.0251	0.000	-0.0228	0.240
λ1	-0.1614	0.000	-0.0550	0.407				
λ2	0.0267	0.507	-0.0325	0.639				
λ3	0.0421	0.000	0.0855	0.000				
λ4	-0.0609	0.172	0.1384	0.114				
λ5	0.3010	0.000	0.1854	0.081				
Constant	3.5248	0.000	2.4333	0.000	3.5619	0.000	2.7114	0.000
Observations	35980		7223		35980		7223	
F test	111.03 (0.00)		29.04 (0.00)		97.56 (0.00)		25.45 (0.00)	
R squared	0.143		0.1793		0.1174		0.1479	

Note: All regressions include province dummies.
Selection term: (λ1) Self-employed, (λ2) Unpaid Family Workers, (λ3) Paid Employed in the Covered Sector (λ4) Unemployed, (λ5) Paid Employed in the Uncovered Sector

7.8. Conclusions

This study has examined the effects of changes in minimum wage on hours worked of paid employment using an Indonesian micro level data set, covering the period 1996 to 2003. Unlike the other countries, the Indonesian minimum wage is set on a monthly basis, particularly for workers with a standard 40 hour workweek, although it is flexible and can be adjusted for part-time workers on a pro-rata basis. Using the similar pooled cross-sectional time-series data methodology of Gindling and Terrell (2007) in Costa Rica, this study extends the hours worked specification by employing two different methods of the selection biased corrections based on multinomial logit, including Lee's and Bourguignon et al's methods. This study also extends the hours worked specification by analysing the effects of minimum wage on hours worked across male-female workers and urban-rural areas.

This study found that an increase in the minimum wage increases hours worked of the existing paid employees. In this case, employers appear to make adjustments by employing the existing workers for more hours as the monthly minimum wage increases. Using Bourguignon et al's method, it is suggested that an increase in the minimum wage will increase the average of paid employment hours worked by 0.27%-0.47% in urban areas, while in rural areas an increase in minimum wage will raise the average male paid employment hours worked by 0.51%. Compared to urban areas, the minimum wage coefficient in rural areas is slightly higher because of the structural transformation in Indonesia marked by a shift in employment from the agriculture sector to the other sectors that require more working hours. In addition, compared to the employment effect in the previous chapter, the effect of minimum wage on hours worked is relatively small. This result implies that hours worked are less sensitive to a change in minimum wage compared to employment due to the fact that the Indonesian minimum wage is set based on monthly terms (not hourly terms) suggesting a change in per-worker cost rather than in per-hour cost.

Bourguignon et al's selection biased correction tends to provide more robust findings in explaining the effects of minimum wage on hours worked in Indonesia. Lee's method seem to give inconsistent results particularly in the case of urban areas, supporting Bourguignon et al's (2007) findings that Lee's method is not robust in the case of big samples. In addition, one of the other advantages of Bourguignon et al's method is that this method provides information about which employment category in the samples causes the selection bias. Compared to OLS, although the difference is relatively small, it is suggested that the minimum wage coefficient using the OLS estimate is underestimated because of sample selection bias.

As mentioned above, this study found that an increase in minimum wage will increase hours worked. By implication, the government should ensure a greater compliance of their labour policy relating to hours worked, including overtime premium, job security for overtime working and minimum wage compliance. An effective control (both from government and trade union at the enterprise level) and sanction for employers who fail to comply with the regulation is required in order to protect workers from any potential exploitation. Moreover, this study found that the effect of minimum wage on hours worked is stronger for female workers as the most vulnerable workers in the labour market. In this case, there needs to be much greater effort made by the government to reduce possible gender discrimination and to ensure equality for them in access to the labour market.

Thus far, this study found that an increase in minimum wage in Indonesia increases hours worked of the existing paid employees (covered sector employment). A further area of research is how the minimum wage affects the relative use of full-time and part-time employment. Gramlich (1976) found that an increase in minimum wage reduced full-time employment and substituted part-time employment. However, it might be different in the case of Indonesia due to that part-time employment being dominated by supply side effects, suggesting that part-time employment is only attractive for some workers at particular stages of their life-cycle, such as women with young children.

CHAPTER VIII

CONCLUSIONS AND POLICY IMPLICATIONS

This thesis examines the effects of changes in minimum wage on wages, employment and hours worked in Indonesia. The main motivation for this thesis was to evaluate the minimum wage policy changes in Indonesia since the end of 1980s. In practice, the minimum wage has been used as an important labour market policy intervention by the Indonesian government since that period as a result of international pressure relating to the violation of international labour standard issues in Indonesia. As pointed out by Rama (2001), this condition forced the Indonesian government to become more concerned about the minimum wage policy by increasing the minimum wage level three-fold in nominal terms (or two-fold in real terms) at the end of 1980s.

Although this thesis is not the first Indonesian minimum wage study, the previous Indonesian studies only focused specifically on the impact of minimum wage on workers in the covered sector or sectors of activities with a high compliance level, such as workers in manufacturing sectors and workers in urban areas (see for example Rama, 2001, and Suryahadi et al, 2003). Moreover, the latest published Indonesian minimum wage study conducted by Alatas and Cameron (2008) focused specifically on the case study of the compliance extension of Jakarta's provincial minimum wage on the Botabek area (Jakarta and West Java border). Compared to the previous minimum wage studies in Indonesia, therefore, this thesis generally contributes to the literature by providing a more comprehensive study of the impact of minimum wage in Indonesia on several aspects of employment (and wage distribution), including covered and uncovered sectors, urban and rural areas, male and female workers, and hours worked.

Compared to developed country studies, there has been little research conducted on the impact of minimum wage changes in developing countries, which are mostly dominated by the studies of Latin American minimum wages. The existing developing country studies usually suggest that an increase in minimum wage reduces employment in the covered sector. More specifically, it is suggested than an increase in the minimum wage displaces the affected workers from the covered sector to the uncovered sector as suggested by the two-sector model, given the large size of the uncovered sector (see for example Gindling and Terrell, 2007; Arango and Pachon, 2004; and Baanante, 2004). Using a rich source of the cross-sectional labour force survey data (Sakernas), this thesis provides a more specific analysis by observing how the distribution of workers changes (including self-employed, paid employment, unpaid family worker, and unemployed) as a result of minimum wage changes. In addition, this thesis also contributes to the literature by examining the impact of minimum wage changes on hours worked in Indonesia using a particular selection biased correction model, providing a complete analysis of any changes in labour demand as minimum wage increases.

There are three main conclusions relating to the study of effects of changes in minimum wage on employment and hours worked in Indonesia as conducted in this thesis. Firstly, the empirical result of this thesis is generally consistent with the competitive model showing the negative impact of minimum wage on covered sector employment. This result is in line with the previous developing country studies suggesting that there is no evidence to support the monopsony model in the case of Indonesia or generally developing countries. Using a regional panel data method, it is suggested that an increase in minimum wage by 10% decreases covered sector employment by 3.01%-4.17%. The magnitude is fairly similar to the other developing country studies. In comparison, an increase in minimum wage by 10% in Colombia reduces employment by 2%-12%, while it is only 0.4%-1% in Costa Rica (Arango and Pachon, 2004 and Gindling and Terrell, 2007).

Secondly, extending the standard competitive model, this thesis shows that an increase in minimum wage is more likely to decrease covered sector employment and to increase uncovered sector employment. This suggests a displacement effect from the covered sector to the uncovered sector as predicted by the two-sector model firstly constructed by Welch (1974). Within the uncovered sector, specifically, this thesis finds that the affected female workers tend to be engaged as unpaid family workers, while the affected male workers are more likely to become self-employed. This displacement effect is stronger for female workers, suggesting that they are more affected by an increase in minimum wage than male workers. Comparing urban and rural areas, the effect is slightly lower in rural areas, supporting evidence that the minimum wage is less binding in rural areas due to the dominance of the traditional agriculture sector, which is less likely to comply with the minimum wage.

My findings generally provide a richer classification than the existing developing country studies. Gindling and Terrell (2007), for example, examined the effects of minimum wage across just two different employment categories, i.e. paid employment (covered sector) and uncovered sector. In addition, this study finds that an increase in minimum wage is less likely to increase the probability of being unemployed. This finding suggests that people are less likely to be unemployed and more likely to be employed in the uncovered sector as the minimum wage increases, given that no unemployment benefits are provided by the Indonesian government.

Thirdly, besides adjusting their numbers of workers (employment) at the *extensive margin*, this thesis shows that employers respond to the minimum wage changes by adjusting their workers' hours at the *intensive margin*, providing a complete adjustment to labour demand as the minimum wage changes. The result contributes to the literature by employing the selection biased correction method based on multinomial logit in order to control for the potential selection bias arising from the correlation between the unobserved factors that affect the choice of employment sectors (i.e. covered and uncovered sectors) and the unobserved factors that affect their hours worked. The empirical results show that an increase in the minimum wage by 10% increases the average of paid employment hours worked by 0.27%-0.51%. This result implies that employers respond to an increase in minimum wage by employing the existing workers for more hours in order to compensate for their loss of employment. However, compared to the employment effect, this thesis suggests that the hours effect is relatively small. The main reason for this is that the Indonesian minimum wage is set based on monthly terms (not hourly terms like in many developed countries), suggesting a greater change in per-worker cost than change in per-hour cost. This evidence contrasts with the developed country studies findings where the minimum wage is usually set based on hourly terms. In developed countries, employers are more likely to respond to a change in minimum wage by adjusting their workers' hours worked than by changing their number of workers since the hours worked adjustment costs tend to be lower than the employment adjustment costs, particularly in the short term (see for example Connolly and Gregory, 2002).

These findings have important policy implications, particularly for Indonesia. Firstly, this thesis finds that an increase in minimum wage reduces employment in the covered sector and increases employment in the uncovered sector, suggesting a displacement effect from the covered to the uncovered sector. As mentioned in chapter 6, the uncovered sector employment usually does not benefit from job security, health insurance, or old-age pensions (employment benefits). This evidence implies that there is a need for labour market policy which is designed not only to improve the standard of living (or welfare) of workers in the covered sector but also for workers in the uncovered sector, given the high proportion of workers in the uncovered sector. The labour market policy that focuses only on workers in the covered sector will lead to wider welfare inequality between workers in the covered and uncovered sectors This displacement effect might even damage uncovered sector employment more if this effect significantly reduces the earnings for uncovered sector employment due to the fact that the labour absorption capacity for uncovered sector employment is also limited.

Second, there is an urgent need to provide clear and detailed guidelines on how the minimum wage is set across regions (provinces). As pointed out by Suryahadi et al (2003) and Widarti (2006), the minimum wage setting, particularly in the decentralization era, relies too much on the workers' needs, without considering the other economic factors, indicated by using the cost of KHM (basic living needs) as the main benchmark for minimum wage setting. Besides the cost of KHM, there is a need to consider the other economic factors, such as productivity at firm level and international competitiveness. Although KHM is typically one of the most important considerations in determining the level of minimum wage, it seems that there needs to be more intensive collective bargaining in the wage commission negotiating process in order to provide a suitable minimum wage that increases the workers' standard of living but without harming sustainable productivity gains and international competitiveness. As a result, the negative employment effects of minimum wage might be diminished.

Third, the minimum wage policy in Indonesia, in practice, is primarily designed to provide a higher standard of living for workers, particularly for workers in the covered sector. However, most workers in the covered sector are not among those people who are living below the poverty line. As pointed out by Rama (2001), people who are living below the poverty line tend to work in the informal sector and small firms which are less likely to be covered by the minimum wage policy. Moreover, chapter 5 confirms that the minimum wage does not have a strong effect at the bottom of distribution, suggesting that the minimum wage policy is not effective in helping the lowest part of the wage distribution due to the lack of enforcement and low compliance. As a result, the minimum wage policy in Indonesia might not have a significant impact on poverty reduction. In addition, Widianto (2003) argues that the minimum wage policy might harm poverty even more if employers respond to an increase in minimum wage (an increase in production costs) by passing the costs to the consumers through increasing their product price (cost push inflation).

Finally, an increase in the minimum wage without sustained economic growth and investment, as in Indonesia, tends to make the impact on the minimum wage more severe. As pointed out by Manning (2003a), if there is no sustained growth in the economy, it will tend to reduce work opportunities in the covered sectors and will create a greater expansion in the uncovered informal sectors. In this case, the Indonesian government has to be able to discover the sources of growth, such as investment and exports, which will absorb more formal employment, particularly in the long run. However, the prospects of investment do not depend only on economic factors, but also political conditions that ensure investor confidence in Indonesia after the economic recession. At the same time, an increase in the minimum wage can be minimized if the government has the capability to push the inflation rate down (and maintain low inflation at a sustainable level), so there is no significant increase in the minimum living needs index which determines the level of the minimum wage.

The first important area for further research regarding the effects of minimum wage on employment in Indonesia is how the minimum wage policy affects welfare of workers in the uncovered (or informal) sector, given the high proportion of workers in the uncovered sector. Standard theory predicts that an increase in minimum wage reduces the earnings for uncovered sector employment because the limitation of labour absorption capacity for uncovered sector employment. Secondly, it is important to see the differential impact across regions given that regional minimum wage exists in Indonesia. According to the standard competitive model, the effects of minimum wage on wage and employment is expected to be higher in regions or groups of observations with a high proportion of workers affected by an increase in the minimum wage compared to the regions or groups of observations with a low proportion of the affected workers. This differential impact across regions is necessary to provide a recommendation or policy evaluation specifically for regional government relating to the minimum wage setting in the regional level, particularly in the decentralization era.

BIBLIOGRAPHY

ABOWD, J. M., KRAMARZ, F., LEMIEUX, T. And MARGOLIS, D. N. (1997), "Minimum Wages and Youth Employment in France and the United States". NBER Working Paper No. 6111, National Bureau of Economic Research, Cambridge, Mass., USA.

AGRAWAL, N. (1995), "Indonesia: Labor Market Policies and International Competitiveness". World Bank Policy Research Working Paper No. 1515.

AHMED, I. And DHANANI, S. (1999), "Indonesia's Recovery: Employment Optimism or Statistical Illusion?". Occasional Discussion Paper Series No. 2, International Labour Office, Jakarta,

ALATAS, V. And CAMERON, L. (2008), "The Impact of Minimum Wages on Employment in a Low Income Country: A Quasi Natural Experiment in Indonesia". *Industrial and Labor Relations Review*, 61(2), 201-223.

AMNESTY INTERNATIONAL (2007), "Exploitation and Abuse: The Plight of Women Domestic Workers". Technical Report No. ASA 21/03/2007.

ARANGO, C. A. And PACHON, A. (2004), "Minimum Wages in Colombia: Holding the Middle with a Bite on the Poor". *Mimeo*, World Bank.

ARELLANO, M. And BOND, S. (1991), "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations". *Review of Economic Studies*, 58(2), 277-297.

ARIFIANTO, A. (2004), "Social Security Reform in Indonesia: An Analysis of the National Social Security Bill (RUU Jamsosnas)". Working Paper, SMERU.

ASADULLAH, M. N. (2006), "Returns to Education in Bangladesh". *Education Economics*, 14(4) , 453-468.

BAANANTE, M. J. (2004), "Minimum Wage Effects Under Endogenous Compliance: Evidence from Peru". *Economica*, La Plata, L(1-2), 85-122.

BAKER, M., BENJAMIN, D. and STANGER, S (1999), "The Highs and Lows of the Minimum Wage Effect: A Time Series Cross-Section Study of the Canadian Law". *Journal of Labor Economics*, 17(2), 318-350.

BECK, N. and KATZ, J. N. (1995), "What to do (and not to do) with Time Series and Cross Section data". *American Political Science Review*, 89(3), 634-647.

BELL, L (1997) , "The Impact of Minimum Wages in Mexico and Colombia". *Journal of Labor Economics*, 15(S3), S102-2135.

BIRCH, E. R. and MILLER, P. W. (2006), "Students Outcome at University in Australia: A Quantile Regression Approach". Discussion Paper, University of Western Australia.

BIRD, K. and MANNING, C. (2002), "The Impact of Minimum Wages on Employment and Earnings in the Informal Sector". Paper presented at the 8th East Asian Economic Association, Kuala Lumpur, 4-5 November.

BOURGUIGNON, F., FOURNIER, M. and GURGAND, M. (2007), "Selection Biased Corrections based on the Multinomial Logit Model". *Journal of Economic Surveys*, 21(1), 174-205.

BROWN, C., GILROY, C. and KOHEN, A (1982), "The Effect of the Minimum Wage on Employment and Unemployment". *Journal of Economic Literature*, 20(2), 487-528.

BROWN, C (1999), "Minimum Wages, Employment, and the Distribution of Income" In *Handbook of Labor Economics*, Vol 3b, ed by O.Ashenfelter, and D.Card, Elsevier Science.

BUCHINSKY, M. (1998), "Recent Advances in Quantile Regression Models: A Practical Guideline for Empirical Research". *Journal of Human Resources*, 33(1), 88-126.

BURKHAUSER, R., COUCH, K. A. and WITTENBURG, D. C. (2000), "A Reassessment of the New Economics of the Minimum Wage Literature with Monthly Data from the Current Population Survey". *Journal of Labor Economics*, 18(4), 653-680.

CALMFORS, L. and HOEL, M. (1988), "Work Sharing and Overtime". *Scandinavian Journal of Economics*, 90(1), 45-62.

CAMPOLIETI, M., GUNDERSON, M., and RIDDELL, C (2006), "Minimum Wage Impacts from a Prespecified Research Design". *Industrial Relations: A Journal of Economy and Society*, 45(2), 195-216.

CARD, D. (1992a), "Do Minimum Wages Reduce Employment?: A Case Study of California, 1987-1989". *Industrial and Labor Relations Review*, 46(1), 38-54.

CARD, D. (1992b), "Using Regional Variation in Wages to Measure the Effects of the Federal Minimum Wages". *Industrial and Labor Relations Review*, 46(1), 22-37.

CARD, D. and KRUEGER, A. (1994), "Minimum Wages and Employment: A Case Study of the Fast Food Industry in New Jersey and Pennsylvania". *The American Economic Review*, 84(4), 772-793.

CARD, D. and KRUEGER, A. (1995), *Myth and Measurement: The New Economics of the Minimum Wage*. Princeton, New Jersey: Princeton University Press.

CARD, D., KATZ, L. and KRUEGER, A (1994), "Comment on David Neumark and William Wascher, Employment Effects of Minimum and Subminimum Wages: Panel Data on State Minimum Wage Laws". *Industrial and Labor Relations Review*, 47(3), 487-496.

CASTILLO-FREEMAN, A. and FREEMAN, R. (1992), "When the Minimum Wage Really Bites: The Effect of the US-level minimum on Puerto Rico". *Immigration and the Work force*, The University of Chicago Press, Chicago, Illinois.

CONNOLLY, S. and GREGORY, M. (2002), "The National Minimum Wage and Hours of Work: Implications for Low Paid Women". *Oxford Bulletin of Economics and Statistics*, 64(Supp/1), 607-632.

COSTA, D. L. (2000), "Hours of Work and The Fair Labor Standards Act: A Study of Retail and Wholesale Trade, 1938-1960". *Industrial and Labor Relations Review*, 53(4), 648-664.

COUCH, K. and WITTENBURG, D. (2001), "The Response of Hours of Work to Increases in the Minimum Wage". *Southern Economic Journal*, 68(1), 171-177.

CURRIE, J. and FALLICK, B. (1996), "The Minimum Wage and the Employment of Youth: Evidence from NLSY". *Jurnal of Human Resources*, 31(2), 404-428.

DHANANI, S. (2004), "Unemployment and Underemployment in Indonesia, 1976-2000: Paradoxes and Issues". Working Paper, ILO, Jakarta.

DHANANI, S. and ISLAM, I. (2004), "Indonesian Wage Structure and Trends, 1976-2000". Working Paper, ILO, Geneva.

DICKENS, R., MACHIN, S. and MANNING, A. (1999), "The Effects of Minimum Wages on Employment: Theory and Evidence from Britain". *Journal of Labor Economics*, 17(1), 1-22.

DIMOVA, R. and GANG, I. N. (2007), "Self-selection and Wages during Volatile Transition". *Journal of Comparative Economics*, 35(3), 612-629.

DOLADO, J., KRAMARZ, F., MACHIN, S., MANNING, A., MARGOLIS, D. and TEULINGS, C. (1996), "The Economic Impact of Minimum Wages in Europe". *Economic Policy*, 23, 317-357.

DUBIN, J. A. and McFADDEN, D. L. (1984), "An Econometric Analysis of Residential Electric Appliance Holdings and Consumption". *Econometrica*, 52(2), 345-362.

EHRENBERG, R. G. (1971), *Fringe Benefits and Overtime Behavior*, Lexington, Mass: Heath.

EL-HAMIDI, F. and TERRELL, K. (2002), "The Impact of Minimum Wages on wage Inequality and Employment in the Formal and Informal Sector in Costa Rica". In *Inequality Around the World*, edited by R. Freeman, Palgrave.

EWOUDOU, J. and VENCATACHELLUM, D. (2006), "An Empirical Analysis of Private Rates of Returns to Education", Working Paper, Oxford Center for the Studies of African Economies.

FAJNZYLBER, P. (2001), "Minimum Wage Effects Throughout the Distribution: Evidence from Brazil's Formal and Informal Sectors". Working Paper, Cedeplar, Brazil.

FALARIS, E. (2008), "A Quantile Regression Analysis of Wages in Panama". *Review of Development Economics*, 12(3), 498-514.

FELICIANO, Z (1998), "Does the Minimum Wage Affect Employment in Mexico?". *Eastern Economic Journal*, 24(2), 165-180.

FERIDHANUSETYAWAN, T., ASWICAHYONO, H. and PERDANA, A. A. (2001), "The Male-Female Wage Differentials in Indonesia". CSIS Working Paper No. WPE 059.

FERIDHANUSETYAWAN, T. and DAMURI, Y. R. (2004), "Economic Crisis and Trade Liberalization: A CGE Analysis on The Forestry Sector". CSIS Working Paper No. WPE 079.

FERIDHANUSETYAWAN, T. and GADUH, A. B. (2000), "Indonesia's Labor Market During the Crisis: Empirical Evidence from Sakernas 1997-1999". *The Indonesian Quarterly*, 28(3), 295-315.

FILER, R. K., HAMERMESH, D. S. and REES, A. (1996), *The Economics of Work and Pay*. New York: Harper Collin College Publisher.

FIRMANA, V. (2006), "Earnings Differential Between Male-Female in Indonesia: Evidence from Sakernas Data". Working Paper in Economics and Development Studies, Padjajaran University.

GALL, G. (1998), "The Development of the Indonesian Labour Movement". *International Journal of Human Resources Management*, 9(2), 359-376.

GHELLAB, Y. (1998), "Minimum Wages and Youth Employment", Employment and Training Papers No.26, ILO.

GINDLING, T. H. and TERRELL, K. (2005), "The Effect of Minimum Wages on Actual Wages in Formal and Informal Sectors in Costa Rica". *World Development*, 33(11), 1905-1921.

GINDLING, T. H. and TERRELL, K. (2006), "Minimum Wages and the Welfare of Different Types of Workes in Honduras". Working Paper, University of Maryland.

GINDLING, T. H. and TERRELL, K. (2007), "The Effects of Multiple Minimum Wage Throughout the Labor Market". *Labour Economics*, 14(3), 485-511.

GRAMLICH, E. M. (1976), "Impact of Minimum Wages on Other Wages, Employment and Family Outcomes". *Brookings Papers on Economic Activity*, No. 2.

GREENE, W. H. (2003), *Econometric Analysis*. Upper Saddle River, N.J. : Prentice Hall.

GUJARATI, D. (2003), *Basic Econometrics*. Boston, Mass; London: McGraw-Hill.

HAMERMESH, D. (1993), *Labor Demand*. Princeton, New Jersey: Princeton University Press.

HART, R. A. (1987), *Working Time and Employment*. London: Allen and Unwin Ltd.

HART, R. A. (2004), *The Economics of Overtime Working*. Cambridge: Cambridge University Press.

HECKMAN, J. J. (1979), "Sample Selection Bias as a Specification Error". *Econometrica*, 47(1), 153-161.

HENDRANI, Y. (2002), "Good Governance in Minimum Wage Setting in the Era of Regional Autonomy". Paper presented at SMERU/PEG Conference, Bandung, December 17th.

HILMER, M. J. (2001), "A Comparison of Alternative Specifications of the College Attendance with an Extension to Two-Stage Selecivity-Correction Model". *Economics of Education Review*, 20(3), 263-278.

HINNOSAAR, M. and ROOM, M. (2003), "Labour Market Impact of the Minimum Wage in Estonia: An Empirical Analysis". Working Paper, Bank of Estonia.

HUSSMANNS, R., MEHRAN, F. and VERMA, V. (1990), *Surveys of Economically Active Population, Employment, Unemployment, and Underemployment: An ILO Manual on Concepts and Methods*, International Labour Office, Geneva.

INDONESIA YOUTH EMPLOYMENT NETWORK (2003), "Indonesia Youth Employment Action Plan 2004-2007". Technical Report.

INTERNATIONAL LABOUR ORGANIZATION (1999), "Wage Policy and Labour Competitiveness in Thailand", ILO, Technical Note.

INTERNATIONAL LABOUR ORGANIZATION (2003), "Report of Survey on the School-to-work Transition in Indonesia". GENPROM Working Paper No. 14.

IRAWAN, P. B., AHMED, I. and ISLAM, I. (2000), "Labour Market Dynamics in Indonesia: Analysis of 18 Key Indicators of the Labour Market (KILM) 1986-1999". Working Paper, ILO, Jakarta.

ISLAM, I. and NAZARA, S. (2000), "Minimum Wage and the Welfare of Indonesian Workers". Working Paper, ILO, Jakarta.

ISLAM, I. (2002), "Poverty, Employment and Wages: An Indonesian Perspective". Working Paper, ILO, Jakarta.

JONES, G., NAGIB, W. and HANDAYANI, L. (1998). "The Expansion of High School Education in Poor Regions: The Case of East Nusa Tenggara, Indonesia". *Bulletin of Indonesian Economic Studies*, 34(3), 59-84.

JONES, P. (1997), "The Impact of Minimum Wage Legislation in Developing Countries where Coverage is Incomplete". Working Paper, Centre for the Study of African Economies, University of Oxford, WPS/98-2.

KAWAGUCHI, D. and YAMADA, K. (2007), "The Impact of the Minimum Wage on Female Employment in Japan". *Contemporary Economic Policy*, 25(1), 107-118.

KOENKER, R. and BASSET, G. (1977), "Regression Quantiles". *Econometrica*, 46(1), 33-50.

KOENKER, R and HALLOCK, K. F. (2001), "Quantile Regression". *Journal of Economic Perspectives*. 15(4), 143-156.

LANJOUW, P., PRADHAN, M., SAADAH, F., SAYED, H. and SPARROW, R. A. (2001), "Poverty, Education and Health in Indonesia: Who Benefits from Public Spending", World Bank Policy Research Working Paper No. 2739.

LEE, L. F. (1982), "Some Approaches to the Correction of Selectivity Bias". *Review of Economic Studies*, 49(3), 355-372.

LEE, L. F. (1983), "Generalized Econometric Models with Selectivity". *Econometrica*, 51(2), 507-512.

LEGAL AID INSTITUTE (1998), "Records of Survey on Wages in 300 Plants in 4 Major Industrial Cities in East Java". Working Report.

LEMOS, S. (2004a), "The Effects of the Minimum Wage on Wages, Employment, and Prices". Working Paper, University of Leicester, No 04/10.

LEMOS, S. (2004b), "A Menu of Minimum Wage Variables for Evaluating Wages and Employment Effects: Evidence from Brazil". Working Paper, University of Leicester, No 04/3.

LEMOS, S. (2004c), "Are Wage and Employment Effects Robust to Alternative Minimum Wage Variables". Working Paper, University of Leicester, No 04/3.

LEMOS, S. (2004d), "Minimum Wage Policy and Employment Effects: Evidence from Brazil". *Economia*, 5(1), 219-266.

LEMOS, S. (2004e), "The Effects of the Minimum Wage in the Formal and Informal Sectors in Brazil". Working Paper, IZA, DP No. 1089.

LEMOS, S. (2005), "How do Alternative Minimum Wage Variables Compare". Working Paper, University of Leicester, No.05/6.

LONG, J. and FREESE, J. (2006), *Regression Models for Categorical Dependent Variables Using Stata*. Stata Corp.

MACHIN, S. and MANNING, A. (1994), "The Effects of Minimum Wages on Wage Dispersion and Employment: Evidence from The UK Wages Council ". *Industrial and Labor Relations Review*, 47(2), 319-329.

MACHIN, S., MANNING, A. and RAHMAN, L. (2003), "Where the Minimum Wage Bites Hard: the Introduction of the UK National Minimum Wage to a Low wage sector". *Journal of the European Economic Association*, 1(1), 154-180.

MALONEY, W. F. and NUNEZ, J. (2001), "Measuring the Impact of Minimum Wages: Evidence from Latin America". Working Paper, World Bank.

MANNING, C. (2000), "Labour Market Adjustment to Indonesia's Economic Crisis: Context, Trends, and Implications". *Bulletin of Indonesian Economic Studies*, 36(1), 105-136.

MANNING, C. (2003a), "Labor Policy and Employment Creation: An Emerging Crisis?". PEG-USAID, Technical Report.

MANNING, A. (2003b), *Monopsony in Motion*. Princeton: Princeton University Press.

McDONALD, J. and MYATT, A. (2004), "The Minimum Wage Effect on Youth Employment in Canada: Testing the Robustness of Cross-Province Panel Studies". Working Paper, University of New Brunswick.

METCALF, D. (2008), "Why Has the British National Minimum Wage Had Little or No Impact on Employment?". *Journal of Industrial Relations*, 50(3), 489-512.

MICHL, T. R. (2000), "Can Rescheduling Explain the New Jersey Minimum Wage Studies?". *Eastern Economic Journal*, 26(3), 265-76.

MINCER, J (1976), "Unemployment Effects of Minimum Wages". *Journal of Political Economy*, 84, S87-S104.

MORETTI, E. and PERLOFF. J. (2000), "Minimum Wage Laws Lower Some Agricultural Wages". Working Paper, University of California Los Angeles.

NAYAR, R. (1996), "Indonesian Labor Legislation in a Comparative Perspective: A Study of Six APEC Countries". World Bank Policy Research No. 1673.

NEUMARK, D. and WASCHER, W. (1992), "Employment Effects of Minimum and Sub Minimum Wages: Panel Data on State Minimum Wage Laws ". *Industrial and Labor Relations Review*, 46(1), 55-81.

NEUMARK, D. and WASCHER, W. (2004), "Minimum Wages, Labor Market Institutions and Youth Employment: A Cross-National Analysis". *Industrial and Labor Relations Review*. 57(2), 223-248.

NEUMARK, D., SCHWEITZER, M. and WASCHER, W. (2004), "Minimum Wage Effects throughout the Wage Distribution". *Journal of Human Resources*, 39(2), 425-450.

PANGESTU, M. and HENDYTIO, M. (1997), "Survey Responses from Women Workers in Indonesia's Textile, Garment, and Footwear Industries". World Bank Policy Research No. 1755.

PAPKE, L. E. and WOOLDRIDGE, J. M. (2005), "A computational Trick for Delta-Method Standard Errors". *Economics Letters*, 86(3), 413-417.

PINDYCK, R. S. and RUBINFELD, D. L. (1998), *Econometric Models and Economic Forecasts*. 4th Ed, Irwin McGraw-Hill.

PURWANINGSIH, Y. and MURTININGSIH (2006), "Determinan Jam Kerja Para Pekerja di Propinsi Jawa Tengah", *Empirika*, 19(1).

RAMA, M. (2001), "The Consequences of Doubling the Minimum Wage: The Case of Indonesia". *Industrial and Labor Relations Review*, 54(4), 864-881.

RICE, R. (2004), "The Contribution of Household and Small Manufacturing Establishments to the Rural Economy". In *The Indonesian Rural Economy: Mobility, Work and Enterprise*, Edited by Thomas Leinbach, Singapore: ISEAS.

RESSLER, R. W., WATSON, J. K. and MIXON, F. G. (1996), "Full wages, Part-Time Employment and the Minimum Wage". *Applied Economics*, 28(11), 1415-1420.

ROCHETEAU, G. and TASCI, M. (2007), "The Minimum Wage and The labour Market", *Economic Commentary*, Federal Reserve Bank of Cleveland.

ROONEY, P. and ANGGRIANI, N. (2006), "The Impact of Formal and Informal Labor Regulations in Business in Serang District", Technical Report, World Bank Jakarta.

SINGH, S. (2004), "Micro and Small-Scale Enterprises in Java: A Gender Based Comparative Analysis of Entrepreneurial Behaviour and Performance of Enterprises". In *The Indonesian Rural Economy: Mobility, Work, and Enterprise*, Edited by Thomas Leinbach, Singapore: ISEAS.

SMITH, J. P., THOMAS, D., FRAKENBERG, E., BEEGLE, K. and TERUEL, G. (2002), "Wages, Employment and Economic Shocks: Evidence from Indonesia". *Journal of Population Economics*, 15(1), 161-193.

SMERU (2003), "Penerapan Upah Minimum di Jabotabek dan Bandung". Technical Report.

SMYTH, I. (1995), "Gender, Change and Insecurity Theoretical Issues and Practical Concerns". *Gender and Development*, 3(3), 6-15.

SOEPROBO, T. (2002), "Indonesia Youth Employment". Working Paper, ILO/Japan Tripartite Regional Meeting on Youth Employment in Asia and the Pacific.

STAIGER, D. and STOCK, J. (1997), "Instrumental Variable Regression with weak Instruments". *Econometrica*, 65(3), 557-586.

STEWART, M. (2002), "Estimating the Impact of the Minimum Wage Using Geographical Wage Variation". *Oxford Bulletin of Economics and Statistics*, 64(Supplement/1), 583-606.

STEWART, M. and SWAFFIELD, J. (2008), "The Other Margin: Do Minimum Wages Cause Working Hours Adjustment for Low-Wage Workers", *Economica*, 75(297), 148-167.

SUGIYARTO, G. and ENDRIGA, B (2008). "Do Minimum Wage Reduces Employment and Training", Working Paper, Asian Development Bank.

SUKATRILAKSANA, L. (2002), "The Effect of Minimum Wages on Employment in Indonesia". *Bulletin Ekonomi Moneter dan Perbankan*, Desember, Bank Indonesia.

SURYADARMA, D., SURYAHADI., A. and SUMARTO, S. (2005), "The Measurement and Trends of Unemployment in Indonesia: The Issue of Discouraged Workers" Working Paper, SMERU.

SURYAHADI, A., WIDYANTI, W., PERWIRA, D. and SUMARTO, S. (2001), "Wage and Employment Effects of Minimum Wage Policy in the Indonesian Urban Labour Market". Working Paper, SMERU.

SURYAHADI, A., WIDYANTI, W., PERWIRA, D., SUMARTO, S. (2003), "Minimum Wage Policy and Its Impact on Employment in the Urban Formal Sector". *Bulletin of Indonesian Economic Studies*, 39(1), 29-50.

TJANDRANINGSIH, I. (2000), "Gendered Work and Labour Control: Women Factory Workers in Indonesia". *Asian Studies Review*, 24(2), 257-268.

TODARO, M, (2006), *Economic Development*. 9th ed, Harlow, Essex: Pearson Addison Wesley.

TROST, R. and LEE, L. F. (1984), "Technical Training and Earnings: A Polychotomous Model with Selectivity". *Review of Economics and Statistics*, 66(1), 151-156.

WELCH, F. (1974). "Minimum Wage Legislation in The United States". *Economic Inquiry*, 12(3), 285-318.

WESSELS, W. (2004), "The Effect of the Minimum Wage on Covered Labor Demand". Working Paper, Duke University.

WIDARTI, D. (2006), "Role of Minimum Wage in Informal Wage Determination in Indonesia", Working Paper, ILO, Jakarta.

WIEBE, F. (1996). "Income Insecurity and Underemployment in Indonesia's Informal Sector", World Bank Working Paper Policy Research No. 1639.

WILLIAMS, N. (1993), "Regional Effects of the Minimum Wage on Teenage Employment". *Applied Economics*, 25(12), 1517-1528.

WILLIAMS, N. and MILLS, J. (2001), "The Minimum Wage and Teenage Employment: Evidence from Time-Series". *Applied Economics*, 33(3), 285-300.

WOOLDRIDGE, J. M. (2006), *Introductory Econometrics: A Modern Approach*. Mason: Thomson South-Western.

YUEN, T. (2003) "The Effect of Minimum Wages on Youth Employment in Canada: A Panel Study". *Journal of Human Resources*, 38(3), 647-672.

ZAVODNY, M. (1998), "Why Minimum Wage Hikes May Not Reduce Employment", *Economic Review*, Federal Reserve Bank of Atlanta, 83(2), 18-29.

ZAVODNY, M. (2000), "The Effect of the Minimum wage on Employment and Hours". *Labour Economics*, 7(6), 729-750.

ZHANG, H. (2004), "Self-selection and Wage Differentials in Urban China: A Polychotomous Model with Selectivity". mimeo, Massachusetts Institute of Technology.

ZUCKER, A. (1973), "Minimum Wages and the Long Run Elasticity of Demand for Low-wage Labor". *The Quarterly Journal of Economics*, 87(2), 267-277.