The Impact of Minimum Wage Legislation in Developing Countries where Coverage is Incomplete

Patricia Jones

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Centre for the Study of African Economies
Institute of Economics and Statistics
University of Oxford
St Cross Building
Manor Road
Oxford OX1 3UL

Correspondence: Patricia Jones at the Institute of Economics and Statistics, University of Oxford. Tel: +44 (0)1865 271952, fax: +44 (0)1865 271094, e-mail: patricia.jones@economics.ox.ac.uk.

Abstract: This paper examines the impact of minimum wage legislation in developing countries where coverage is incomplete. Using a rich data set from Ghana, it estimates the extent to which a binding minimum wage alters employment in both the formal and informal sectors of the labor market. The data reveal that Ghana's minimum wage policies during the 1970s and 1980s led to a reduction of formal sector jobs and an increase in informal sector jobs. In addition, there is some evidence to suggest that a large proportion of the displaced workers from the formal sector ended up working in the informal sector.

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I. Introduction

Most developing countries have minimum wage laws which, in principle, guarantee low-skilled workers a wage high enough to cover their basis needs. Such laws are popular with public policy makers because they are believed to raise the incomes of the working poor. There is, of course, a downside to minimum wage legislation. When the minimum exceeds the equilibrium wage, jobs are rationed and there is always a risk that unemployment could rise. Assessing the total impact of minimum wage legislation, however, is not an easy task. While it is clear that a binding minimum will lower the level of *employment*, it is not so clear what impact it will have on the level of *unemployment*. By definition, unemployment rises when there is an increase in the number of unemployed workers who are seeking jobs[1]. Such a situation may or may not arise as a result of minimum wage legislation.

So, is the introduction of a minimum wage a good means for raising the incomes of the working poor? Despite its popularity, there are several reasons to believe that minimum wages may not be an effective policy instrument for reducing poverty. First, many workers are not covered by minimum wage legislation, particularly in developing countries. In Ghana and several other African countries, for example, employers have no legal obligation to pay apprentices and casual workers the minimum wage. In addition, it is common practice for part-time workers, domestic servants, the self-employed and child laborers to be excluded from coverage. Not surprisingly, these groups of workers are often among the lowest paid in the workforce.

Incomplete coverage, however, is not simply a result of poorly written legislation. A significant proportion of workers in low-income countries are not covered by minimum wage laws for the simple reason that they work outside the wage sector. In Sub-Saharan Africa, for example, 68 percent of the labor force engage in agricultural activities and many of these laborers do not earn a wage but, instead, survive by selling or consuming their own farm output (World Bank, 1996). Moreover, a growing proportion of urban workers earn their living by working at one (or more) informal sector activities. Usually informal sector workers do not earn a wage but, even if they do, it is likely to fall below the minimum. A recent survey of the informal sector in Africa, for example, revealed that over 80 percent of the firms in Swaziland and nearly 98 percent of the firms in Niger do not comply with minimum wage legislation (Squire and Suthiwart-Narueput, 1995). Ironically, it is workers in these firms whose incomes are most likely to fall below the poverty line.

Second, even in countries where a large proportion of the workforce is engaged in wage employment, there is no guarantee that the minimum wage will have any "bite" if the level of firm compliance is low. It is a well-recognized fact that firms are likely to evade minimum wage legislation when either the probability of detection is low or the costs of compliance are high. In many developing countries minimum wage laws have little impact because of lax enforcement which increases firms' incentive to cheat. Lax enforcement usually occurs as a result of poor administration and the inability of regulators to carry out adequate inspection of firms. Similarly, firms have an incentive to cheat when the distortionary costs of the minimum wage are high. Such a situation arises when the minimum wage is above the market equilibrium (i.e., it is binding) and the relevant elasticities of supply and demand are high enough to make a substantial impact on firm efficiency (Squire and Suthiwart-Narueput, 1995).

Third, even in countries where coverage and compliance is high, minimum wage legislation may have the undesired effect of reducing the demand for low-skilled workers. This effect occurs

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[1] The definition of unemployment used for most official statistics defines a worker as unemployed if he/she is currently not employed and has searched for work in the last month.

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because firms prefer to hire (or maintain in employment) those workers whose wages have risen by the smallest proportion as a result of the minimum. As explained by Welch (1974, p.292),

> If all those who would earn less than the minimum are substitutes, then employers will substitute in favor of those workers whose relative costs have increased least and these (indirect) effects may dominate. This is the presumption underlying the "ripple effect" which holds that for workers above the minimum labor demand increases and the effect declines with the distance from the minimum. For workers who would have been below the minimum the converse holds and adverse employment effects increase with the distance from the minimum.

Consequently, a binding minimum wage may actually reduce the demand for those workers whom it intends to benefit.

In developing countries this "ripple effect" may have an even larger impact that it does in developed countries where workers are protected (at least to some extent) from adverse demand shocks by mechanisms like unemployment insurance. Without such benefits workers who are displaced have only two choices: (1) go to work in the "uncovered" sector or (2) become unemployed and search for work in the "covered" sector. Since most unskilled workers in developing countries have little savings on which to fall back during unemployment spells, it is unlikely that poor workers who lose their job will remain unemployed for any substantial length of time. A more likely scenario is that the displaced workers will take up some form of informal sector employment. Theory predicts that informal sector wages will fall when the supply of labor to the informal sector rises and there is no matching rise in demand.

Few studies examine the impact of minimum wage legislation on employment in both the "covered" and "uncovered" sectors. This paper partially fills this void by investigating the extent to which minimum wage legislation in Ghana during the 1970s, 1980s, and early 1990s affected employment opportunities in its formal and informal sectors. To assess the impact of Ghanian minimum wage legislation, the study employs two sets of data: one time series and one set of cross-sectional data. These data sets are unusual in several ways. The time-series data include aggregate employment figures which are classified according to whether the workers are employed in the formal or informal sector. In addition, the cross-sectional data contain firm-level employment figures which cover the period both immediately before and after the implementation of a new minimum wage law. These data sets are somewhat unusual in that they include employment data on firms which operate in both the formal and informal sectors.

The remainder of the paper is organized as follows. Section II presents a simple model of the impact of minimum wage legislation in labor markets with complete and incomplete coverage. Section III discusses the pattern of minimum wages that were dominant in Africa during the 1970s, 1980s, and early 1990s. Section IV plots the wage distributions of workers in the formal and informal sectors in order to assess the extent of compliance among Ghanaian manufacturing firms. This section also presents histograms for several types of workers which highlights the lack of coverage among certain categories of workers. Section V reports the main results from the time-series and cross-sectional analysis. Finally, Section VI concludes the chapter.

II. Employment Effects in Labor Markets with Complete and Incomplete Coverage
The purpose of this section is to review the theoretical framework used for assessing the impact of minimum wage legislation. Although numerous studies in the past have examined the consequences of minimum wage legislation, few have focused on its impact in dualistic labor

markets.[2] This omission is somewhat surprising, given the large proportion of workers in low-income countries who are engaged in informal sector employment and other non-wage activities. To assess the full impact of minimum wage legislation in developing countries, it is therefore necessary to outline the effects of the minimum in both the "covered" and "uncovered" sectors.

A. Complete Coverage

1) Standard Competitive Model
The simple textbook model is easily illustrated by the Marshallian cross in Figure 1. This model assumes a competitive labor market with homogeneous workers who earn W_0 before the minimum wage is set and W_m after the minimum wage is set. In this labor market all workers have the same skills and effort levels (i.e., they are perfect substitutes), all employers pay the minimum wage (i.e., coverage is complete), and employment is determined simply by supply and demand. Initially the equilibrium level of employment is at E_0 but the level falls to E_m after the minimum wage is implemented; E_m represents the demand for labor at W_m. The proportional decline in employment $(lnE_m - lnE_0)$ is equal to the proportional rise in the wage $(lnW_m - lnW_0)$ multiplied by the elasticity of demand.

It is clear from Figure 1 that an excess supply of labor $(S_m - E_m)$ arises once the minimum wage is introduced. This excess supply, however, should not be interpreted as the rise in unemployment which occurs as a result of the legislated minimum. Typically, the official measure of unemployment is the number of workers who are currently not in paid employment but are seeking work. Unless all workers who make up the excess supply of labor actually believe that they have a good chance of getting a job, some workers will choose not to engage in any type of job search. This means that the number of unemployed will be some fraction less than the number of workers comprising $(S_m - E_m)$. The fraction who are unemployed can only be determined by probabilistic models which take into account various factors which determine a worker's chance of obtaining employment. While such a model is beyond the realm of this chapter, the point I wish to emphasize is that the simple textbook model can make few inferences about the impact of a minimum on the unemployment rate. What the model does tell us is that the level of employment will decline as a result of the introduction of a minimum above the equilibrium wage; it provides no information about how the number of unemployed will be affected.

2) Monopsony Model
Contrary to the competitive model which predicts that a minimum wage will lower the level of employment, the monopsony model predicts the opposite effect. According to Stigler's (1946) textbook case, the marginal cost of labor to firms with monopsony power always exceeds the supply price of labor (Figure 2). Monopsonists are assumed to minimize costs by hiring workers up to the point at which the marginal cost of labor is equal to their demand for labor. This point occurs at E_0 in Figure 2. Once a minimum wage is introduced, the monopsonist becomes a price-taker up to the competitive wage rate, W_1. Consequently, a minimum wage which is set at W_1 leads to an increase in employment from E_0 to E_1. If the minimum wage were set at a level higher than W_1, employment would be reduced below its competitive level, E_0.

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[2] See Welch (1974), Mincer (1976), Gramlich (1976), and Jones (1987) for a theoretical discussion of the effects of minimum wage legislation under incomplete coverage. None of these papers, however, apply the analysis to a development context.

Until recently, the monopsonist case has been viewed largely as an analytical curiosity with little application to the real world. In the last few years, however, a number of empirical studies have found evidence that a higher minimum wage is associated with a *rise* in employment. Card and Krueger (1994), for example, examine the level of employment in fast-food restaurants before and after a rise in the minimum wage in New Jersey. They compare employment growth in New Jersey restaurants with the employment growth in similar fast-food restaurants in Pennsylvania (a state with similar demand conditions where the minimum wage was held constant). The authors find that employment in New Jersey rose relative to that in Pennsylvania, despite the fact that New Jersey had entered a recession after the introduction of the minimum wage. Moreover, employment in New Jersey expanded in low-wage whereas it contracted in high-wage restaurants—a result contrary to the assumed "ripple effect". Other studies have also found evidence that minimum wages have little or no impact on employment (Card, 1992; Card and Krueger, 1994; Machin and Manning, 1994; and Manning, 1996). Such results have been interpreted in many economic circles as empirical evidence in support of the monopsonist case.

B. Incomplete Coverage

1) Standard Competitive Model

As discussed above, the assumption that all workers in developing countries are covered by minimum wage legislation is clearly unrealistic. Throughout the developing world a significant proportion of the workforce earn their living through non-wage activities like self-employment, informal sector work, and domestic services. Thus, it is more appropriate to apply a model in which coverage is incomplete when examining the effects of labor market interventions in low-income countries. The earliest model to include a sector in which workers were not covered by the minimum wage was put forward by Welch (1974). The basic intuition behind the Welch model is straight forward and can easily be applied to a development context.

Let's assume initially that there is perfect mobility across sectors and all workers are identical and paid the same wage, W_0. Since there is no wage differential across sectors, workers are indifferent between informal and formal sector work. Consequently, the level of employment is the same in the two sectors because there is an equal demand for labor in both sectors (Figure 3). By imposing a minimum above the equilibrium wage rate, jobs in the formal sector are rationed (Figure 4). As a result of the higher minimum, W_F, some workers who would like to work at the minimum are unable to find jobs. There is now an excess of labor $(S_C - E_C)$ comprised of workers who would like to be employed in the formal sector. If all of these workers go to work in the informal sector, employment in the informal sector will rise to $E_C 0_I$ and wages will fall from W_0 to W_I. Thus the introduction of a minimum has led to a wage differential of $(W_F - W_I)$ and a reduction of formal sector employment by the amount $(E_0 - E_C)$.

The impact of a minimum wage is somewhat different when there is no labor mobility between sectors (Figure 5). Once again, the introduction of a minimum raises the wage in the formal sector from W_0 to W_F and creates an excess supply of labor $(S_C - E_C)$ to the formal sector. Because labor supply is completely inelastic, no workers shift into informal sector employment and unemployment $(E_C - \bar{F}_F)$ emerges among formal sector workers. There are many reasons why labor supply may be inelastic with a wage fixed above the market-clearing rate. For example, trade union power, efficiency wages, and rent-sharing may all lead to situations in which it is in the employer's interest to maintain its wages above the equilibrium rate. The same is not true in the informal sector where wages are assumed to be very elastic. Moreover, the supply of informal sector workers remains the same both before and after the introduction of the minimum wage; it

equals $(\bar{L}_F 0_I)$. Consequently, minimum wage legislation has little impact on workers in the informal sector. Unlike the case of perfect labor mobility, the entire brunt of the legislation falls on the shoulders of workers in the formal sector who experience a rise in unemployment.

2) Monopsony Model

The monopsony model in the case of a dualistic market is somewhat complicated. To make the analysis easy, let's assume that only firms in the "covered" sector can possess monopsony power. This assumption may seem unrealistic but it is easy to imagine at least one situation in which employers in the "covered" sector could have monopsony power while employers in the "uncovered" sector remain competitive. Such a situation might arise if workers have invested in skills that are not easily transferred across firms. Imagine, for example, that a small proportion of workers in some developing country have trained to be computer programmers in C++ because the salary of such programmers is five times the average salary. These workers face one problem: only a handful of large companies employ C++ programmers and all of these firms are located in the capital city. If there is no shortage of such programmers, it is conceivable that firms who demand C++ programmers may possess some monopsony power. This is because all workers who are proficient in C++ prefer to work in firms that own C++ software rather than in any other type of firm[3]. The fact that these workers are not paid their marginal product does not matter: they are still earning more than they could in any other type of firm. Of course, this situation is only realistic when there is no shortage of C++ programmers. If there were a shortage, any firm could poach its rivals' programmers by simply offering a higher wage.

When some firms have monopsony power, the introduction of a minimum wage will raise the level of employment in the non-competitive sector (Figure 6). Before the minimum wage, firms with monopsony power hire workers up to the point at which the marginal cost of labor equals the demand for labor. This results in $O_F E_0$ workers employed in the formal sector and $E_0 0_I$ workers employed in the formal sector. Workers in the formal sector prefer their work to employment in the informal sector because their wage, W_0, is substantially higher than the wage of workers in the informal sector, W_I. Any minimum wage which lies above W_0 and is less than or equal to W_I will have the desired effect of increasing formal sector employment. For example, If the minimum is set at W_I, formal sector employment will expand to $E_I 0_I$.

III. Three Decades of Minimum Wage Policies in Africa

It is often claimed that African governments acted irresponsibly with respect to minimum wage legislation before the era of structural adjustment. The evidence, however, does not support such a claim. Table 1 lists the value of the real minimum wage in a wide range of African countries. The broad pattern which emerges is that minimum wages in Africa generally rose during the first half of the 1970s and then fell during the next decade and a half. In some cases, the erosion of the minimum during the late 1970s was massive. In Zaire, for example, the real value of the minimum fell by almost 600 percent between 1975 and 1980. The Ghanaian minimum wage experienced a similar decline; its real value fell by over 500 percent over the same period.

In other countries the value of the minimum eroded continuously from the mid-1970s through to 1990. In the Cote d'Ivoire, for example, the real value of the minimum declined for

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[3]   C++ programmers prefer to work in firms that own C++ software because they will be paid a wage premium for their programming skills. If they move to a firm which uses another software, their skills will not be as well matched. Consequently, the firms that own C++ software can pay their programmers *less* than their marginal product as long as they pay them more than they could earn elsewhere.

fifteen years, falling from 114 in 1975 to 79 in 1990. Similar declines were experienced by Gabon, Kenya, Senegal, and Togo. Liberal wage policies were also followed by the governments in Benin and the Congo over the period 1975 to 1985. The value of the minimum in these countries declined by 52 percent and 61 percent, respectively. Other African countries— Botswana, Burkino Faso, Malawi, Niger, and Tunisia— had a more mixed pattern of minimum wage legislation. In these countries the value of the minimum fluctuated somewhat over the period 1975 to 1990, declining in some periods while rising in others. Only in Morocco did the value of the minimum rise continuously from 1975 onwards.

As was the case in many African countries the real value of the minimum wage in Ghana rose to record levels during the first half of the 1970s and then fell from 1975 to 1990. Between 1970 and 1975 the value of the minimum increased by more than 40 percent for private sector workers and by more than 80 percent for public sector workers[4]. After 1975 the government's attitude toward the minimum changed considerably in response to a number of budgetary and political crises. Faced with a growing debt problem, the government allowed the real value of the minimum to be eroded by almost a decade of rising inflation. By 1985 the value of the minimum had fallen to less than a third of its value in 1975 (see Figure 7). Public sector wages also fell during the period 1975 to 1980, although the government intervened after 1980 to prevent further erosion (see Figure 8). Public sector wages rose in real terms between 1980 and 1981, then fell the next year, and then rose in value during every successive year from 1983 until 1988. The same wage protection, however, was not granted to private sector workers. The private sector minimum wage fell in value during the period 1981 to 1984, then rose between 1984 and 1985, and then fell again during each year until 1988. Indeed, in 1988 the value of the minimum was five times less than it had been in 1970.

Not all of the decline, however, was a direct by-product of the government's wage policy[5]. Average wages in Ghana also fell throughout the period 1975 to 1983 (see Figure 9). This decline was due largely to the collapse of the economy which was brought on by a succession of political crises. Between 1975 and 1983 both average wages and the minimum fell at much the same rate. The same is not true of the period 1983 to 1988. During these years average wages rose at a much faster rate than the minimum. Between 1983 and 1984, for example, the ratio of the minimum wage to the average manufacturing wage fell from 0.50 to 0.26. By 1989 the value of the minimum wage just 15 percent of the value of the average manufacturing wage. Clearly the low level of the minimum relative to average manufacturing wages meant that it had little effective "bite" since the average Ghanaian industrial worker was paid almost two-thirds more.

The government's position on minimum wage legislation changed again during the early 1990s. In August 1991 the Government of Ghana declared a new daily minimum wage which raised the old minimum in real terms by over 25 percent. The aim of this legislation, which was supported by both the trade union movement and the Ghana Employers' Association, was to increase the purchasing power of low-income workers. Such legislation was unusual both in the size of its mandated increase (over 100 percent in nominal terms) and the timing of its passage. Throughout the 1980s the real value of the minimum had fallen steadily due to higher-than-

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[4]   Ghana has a de facto two-tiered minimum wage system. There is an official minimum wage which is agreed upon during negotiations between the government, the Trade Union Congress, and the Ghana Employers' Association. There is, however, another minimum which is paid to public sector workers.

[5]   The government's role with respect to minimum wage legislation was by no means passive between 1983 and 1990. On six separate occasions it passed minimum wage increases.

expected inflation which quickly eroded the government's modest, nominal increases. By contrast, the 1991 law came into effect during a period of falling inflation which meant that its "bite" was expected to be large.

IV. Minimum Wages and the Wage Distribution in Ghana

One way of assessing whether the minimum wage is actually enforced is to plot the earnings of individuals as a histogram. The position and shape of the histogram provide information on the extent of compliance. If there were no government intervention in the labor market, one would expect the wage distribution to be relatively smooth, reflecting the underlying distribution of skills among workers. On the other hand, if employers actually enforce the minimum, there will be some workers who would have earned less than the minimum but are no longer employed. The fact that some workers have lost their job should create a spike in the wage distribution which is relatively close to the legally imposed minimum. If there is no spike or if the spike lies significantly to the right or the left or the minimum, the data indicate that the minimum has little effective "bite".

The data used to plot the histograms in this section are taken from a 1992 survey of Ghanaian manufacturing workers which was completed as part of the World Bank's 'Regional Program on Enterprise Development' (RPED). These data were collected over the period July to September 1992 and therefore reflect the earnings of workers approximately one year after the initial increase in the minimum wage. It is expected that any firm that wanted to comply with the new legislation would have adjusted its workers' wages by this date[6]. Although it would have been preferable to have data on 1991 earnings, the 1992 data provide a good picture of both the shape of the Ghanaian wage distribution and the number of workers who earn less than the minimum wage[7].

Several histograms are presented for different groups of workers. The wage distribution of all full-time employees (i.e., employees who work 40+ hours per week) is depicted in Figure 10. In this diagram there is a definite clustering of wages near the minimum which suggests that a large proportion of Ghanaian manufacturing firms do comply with the labor legislation. There is also spike in the wage distribution near the minimum, indicating that some workers have probably lost their job as a result of the minimum. The pattern of wages in Figure 10 clearly contrast with those plotted in Figure 11 which depicts the wages of workers in the informal sector[8]. As expected, the majority of workers in the informal sector earn a wage that is less than the minimum. But there is also a spike near the minimum which indicates that some firms in the informal sector comply with the labor legislation. Overall, the shape of the two histograms suggests that the level of firm compliance is relatively high in Ghana, except in the informal sector where the majority of workers earn less than the minimum.

The next few histograms plot the wages of different categories of workers. Figures 12 and 13 present the wage distribution of production and non-production workers, respectively. In Figure 12 there is a spike in the distribution near the value of the minimum which is consistent with the prediction that some production workers have lost their job as a result of the labor

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[6]   It should be noted that the earnings data were collected before the second large increase in the minimum which occurred at the end of 1992.

[7]   The real value of the minimum wage in 1990 prices is 14,913 cedis.

[8]   The informal sector is defined as all firms that use only hand tools.

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market intervention. From the shape of the distribution, however, it appears that the majority of production workers are paid a wage which either equals or exceeds the minimum wage. The same is not true for non-production workers. It can be seen from Figure 13 that most non-production workers are paid a wage far in excess of the minimum. Indeed, the spike in the wage distribution of non-production workers is much to the right of the minimum, indicating that the minimum is not at all binding.

A similar pattern occurs in the wage distribution of union workers which is depicted in Figure 14. Most union workers are paid a wage that exceeds the minimum, although a small spike does occur near the value of the minimum which suggests that the minimum is binding in some union firms. Quite surprisingly, the minimum is also binding for non-union workers as seen in Figure 15. Only about half of all non-union workers appear to be paid a wage which equals or exceeds the minimum. The last two histograms plot the wages of workers who are high-skilled or low-skilled[9]. Figure 16 plots the wage distribution of high-skilled workers and Figure 17 plots the wage distribution of low skilled workers. Notice that in Figure 16 a spike appears near the minimum, even though a large proportion of high-skilled workers earn more than the minimum. By contrast, there is no spike near the minimum in Figure 17; the spike occurs far to the left of the minimum for low-skilled workers. Thus, high-skilled workers tend to earn at least the minimum whereas low-skilled workers tend to earn less than the minimum.

V. Assessing the Impact of the Minimum Wage on Ghanaian Employment

Until recently, most of the literature on minimum wages has been dominated by time-series analysis (see Brown, Gilroy, and Kohen (1982) and Hammermesh (1993) for a survey of these studies). Typically, the results from such studies provide strong evidence that a binding minimum will have a large, negative impact on employment, particularly teenage employment. Although the shortcomings associated with the use of such aggregate data are well-known (see Hammermesh, 1993), it is still useful to estimate a time-series relationship in order to compare the Ghanaian results to those estimated for other countries[10]. Specifically, I estimate the following equations:

$$\ln(w)_t = a + b\ln(minw)_t + cX_t + dt + \varepsilon \tag{1}$$

$$\ln(Emp/Pop)_t = a' + b'\ln(minw/avgw)_t + c'X_t + d't + \varepsilon \tag{2}$$

where w_t is the average manufacturing wage, (Emp/Pop) is the size of the labor force divided by the country's population, $(minw)_t$ is the legally imposed minimum wage, $(minw_t/avgw_t)$ is the minimum wage deflated by the average manufacturing wage, t is a time trend, and X_t is set of macro variables which control for business cycle fluctuations, terms of trade shocks, and weather variability. The macro variables include $(GDP)_t$, $(p)_t$, $(coc)_t$, $(fer)_t$, and (ERP) where $(GDP)_t$

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[9]   High-skilled workers are those who have completed 9 years or more of education whereas low-skilled workers are those who have completed less than 9 years of education.

[10]   The most obvious problem associated with aggregate data is the inability to control for many factors which affect wages (e.g., individual skills, firm characteristics, etc.). By excluding such variables, the estimates may be biased due to the omission of relevant variables.

is the nominal gross national product, $(p)_t$ is the GDP price deflator, $(coc)_t$ is the export price of cocoa, $(fer)_t$ is the domestic price of fertilizer, and (ERP) is a dummy variable indicating whether the government has begun its program of structural adjustment. Large fluctuations in any of these variables (except the dummy policy variable) can affect both wages and employment.

The data used for the time-series analysis are based on several sources. The data on average manufacturing wages were taken from numerous editions of the *Yearbook of Labour Statistics* which is published by the International Labour Office (ILO). The GDP figures, the price deflator, and the cocoa export prices were taken from the 1996 edition of the *International Financial Statistics* which is compiled by the International Monetary Fund. The figures on informal sector employment and female employment were derived from statistics reported in the *African Employment Report* (1990), an occasional report that is published by the ILO. The population figures were down loaded from the on-line data base of the *Penn World Tables 5.6*[11]. Lastly, the labor force figures and the fertilizer prices were collected from World Bank's on-line data base of *Social Indicators of Development* (1995).

One last variable needs some further explanation. The dummy variable (ERP) indicates whether the government had begun its structural adjustment program. In 1983 the Ghanaian government launched its "Economic Recovery Program" (ERP), an IMF-led program which set into motion a wide range of stabilisation and liberalisation policies that were implemented during the next decade. To coincide with the years of structural adjustment, the dummy variable (ERP) takes a value of one for the years 1983 to 1991, inclusive. The structural adjustment policies included, *inter alia*, trade liberalization, foreign exchange liberalization, and a large retrenchment of public sector employees.

Table 3 presents the results from estimating equations (1) and (2)[12]. If the labor market in Ghana were fairly competitive during the 1970s and 1980s, it would be expected that the minimum would have a positive impact on wages and a negative impact on employment. The aggregate data provide some evidence to support this prediction. Notice in column (2) that the minimum wage effect is positive and significant at the 1 percent level. By contrast, the minimum wage effect reported in column (1) is negative and insignificant. The difference between the specifications in these two columns is that the private sector minimum is used in column (1) whereas the public sector minimum is used in column (2). Thus the results suggest that the public sector minimum had a much larger impact on wages than the private sector minimum. This is not surprising, given that most Ghanaians who work in the wage sector are employed by the government[13].

The results from estimating equation (2) provide fairly strong evidence that the minimum wage in Ghana had a negative impact on employment. The elasticity of employment to the private sector and public sector minimum is 0.12 (column 3) and 0.17, respectively. The elasticities reported in columns (3) and (4) imply that Ghana experienced significant job losses during the 1970s and 1980s as a result of its minimum wage policies. While these elasticities may seem small

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[11] See Summers and Heston (1991) for a description of the these data.

[12] Durban-Watson statistics were calculated for all regressions in order to test for autocorrelation. In regressions where the Durban-Watson statistic was either above the appropriate critical value or in the inconclusive region, the Prais-Winston (1954) estimator was used to correct for any possible serial autocorrelation.

[13] According to the *African Employment Report* (1990), over 80 percent of Ghanaian workers in wage employment during the 1980s were public sector employees.

in size, they are similar in magnitude to the elasticities estimated for Puerto Rico (Castillo-Freeman and Freeman, 1992) and for Colombia (Bell, 1995). Moreover, they are considerably larger than those estimated for Indonesia (Rama, 1996).

As discussed earlier, one effect which is not captured by conventional models is the impact which the minimum has on informal sector employment and wages. One would expect that a large proportion of the workers in poor countries who are displaced by minimum wage legislation will end up working in the informal sector. If demand conditions in the labor market do not change, the influx of workers to the informal sector will reduce wages in the "uncovered" sector. To explore the effect of the minimum on informal sector employment, the dependent variable in equation (2) is replaced by $\ln(infl/emp)$ where $infl$ is the number of workers in the informal sector and emp is the size of the total labor force. Columns (1) and (2) of Table 4 report the results from estimating this equation. As expected, the minimum has a positive effect on informal sector employment, although the coefficient on $\ln(infl/emp)$ is only significant when the public sector minimum is used in the estimation. The implied elasticities suggests that a large proportion of the public sector workers displaced by the minimum wage shifted into informal sector employment. This can be inferred by comparing the minimum wage effect in column (4) of Table 3 with the minimum wage effect in column (2) of Table 4. Notice that the employment elasticities in the two tables have opposite signs but are very close in size.

Another possible effect of the minimum is a decline in female employment. In many developing countries women face considerable discrimination in the labor market. It is easy to imagine a situation arising in which employers lay off women before men when labor costs rise as a result of an increase in the minimum wage. In this paper, I examine the extent to which the minimum wage affected female employment by replacing the dependent variable in equation (2) with $\ln(fem/emp)$ where fem is the number of female workers. The results from estimating this equation are reported in columns (3) and (4) of Table 4. Surprisingly, the minimum wage had no significant effect on female employment. Moreover, the coefficient on $\ln(fem/emp)$ is positive, suggesting that minimum wage legislation had a favorable impact on female employment. It is possible, for example, that more women entered the labor force in response to a fall in formal sector employment which is largely dominated by men.

Cross-sectional analyses based on establishment data provide a potentially stronger test of how the minimum wage affected employment in Ghana. The data used in the following analysis are from a panel survey of 200 manufacturing firms organized under the World Bank's 'Regional Program for Enterprise Development' (RPED). For the purposes of this study, only data from the first two waves of the survey are used. These surveys were conducted during the summers of 1992 and 1993 but the data refer to the previous year. Consequently, the first wave data correspond to the period immediately before the introduction of the August 1991 minimum and the second wave data correspond to the period immediately after its introduction. Table 5 provides a list of the definitions and descriptive statistics of the variables used in the cross-sectional analysis.

This study adopts the same methodology used by Card and Krueger (1994) to estimate the impact of the minimum wage on employment. The following two equations are estimated using the Ghanaian establishment data:

$$E_i \quad a \quad bX_i \quad cMinw_i \quad \varepsilon_i \tag{3}$$

$$E_i = a' + b'X_i + c'GAP_i + \varepsilon_i \qquad\qquad (4)$$

where E_i is the change in employment from wave 1 to wave 2 at firm i, X_i is a vector of firm characteristics, and ε_i is a normally distributed error term. Variables are included to control for differences across firms in their capital-labor intensity, region, industry, unionization, minimum wage compliance, and sector (i.e., informal versus formal).

Two measures are used to assess the impact of the minimum on employment at firm i. The first measure, $Minw_i$, is defined simply as the real minimum wage deflated by the unskilled wage at firm i. The second measure, GAP_i is defined as follows:

$GAP_i \;\; = 0 \qquad$ if the wages of production workers in firm i exceeded the minimum in wave 1 (i.e., $W_i \geq 14{,}913$)

$GAP_i \;\; = \qquad (14{,}913 - W_i)/W_i$ for all other firms.

In other words, GAP_i represents the proportional increase in wages at firm i necessary to raise production workers' wages to the minimum. It is expected that small values of GAP_i will be associated with small employment changes. Therefore, GAP_i will be negatively associated with employment if the minimum has adverse employment effects.

The results of estimating equations (3) and (4) are reported in Table 6. Both minimum wage measures have a negative impact on firm employment. Given the average size of a firm in the sample (approximately 50 workers), the estimate in column (1) implies an employment elasticity of about -6.0%. This minimum wage effect is similar in magnitude to that experienced by Puerto Rico (Castillo-Freeman and Freeman, 1992), Colombia (Bell, 1995), and teenagers in the United States (Hammermesh, 1993). A negative minimum wage effect is also found when GAP_i replaces $Minw_i$ in the estimated model. The mean value of GAP_i among Ghanaian firms in the RPED sample is 0.92. Thus the estimate in column (2) suggests a fall of about 2.5 additional workers in firms which complied with the minimum wage legislation relative to those that evaded the law.

In column (3) a somewhat stronger test of the minimum wage effect is provided by adding a set of variables to the model which controls for regional effects, capital intensity, and the dualistic nature of the labor market. When these variables are included, the minimum wage effect captured by $Minw_i$ barely changes: the implied employment elasticity is still about -6.0%. There is, however, a huge difference in the coefficient on GAP_i. The minimum wage effect captured by GAP_i in column (4) is both positive and significant, although quite small in size. The estimate in column (4) suggests an *increase* of about 0.25 workers in firms that complied with the legislation as compared to those which evaded the minimum. Since most firms that pay wages in excess of the minimum are large firms, this result provides some evidence in support of the monopsony case among large firms. This result is not too surprising, given the evidence presented in Jones (1997) that some firms in Ghana behave like monopsonists by paying workers less than their marginal product. Moreover, a similar effect has been found in Indonesia (Rama, 1996) where the employment in large firms appears to have risen during the early 1990s in response to a higher minimum wage.

11

VI. Summary

One aspect of the minimum wage literature that has been largely neglected in previous empirical studies is the effects of incomplete coverage on wages and employment. This neglect is particularly surprising within a development context, given the large proportion of workers who are not employed in the formal sector. Moreover, the assumption of complete coverage may produce misleading results because models which assume complete coverage overlook how minimum wage laws affect workers in the informal sector.

In this paper, I discuss the employment effects of minimum wage legislation in labor markets with both complete and incomplete coverage, highlighting the possible problems such laws present in poor countries where displaced workers do not have sufficient savings to "hold out" for formal sector employment. It is shown that minimum wage laws can lead to a rise in informal sector employment and a fall in informal sector wages. Several models are estimated which capture the minimum wage effects on workers in both the "covered" and the "uncovered" sectors. These models are estimated using two unique data sets from Ghana: one set of aggregate data and one set of establishment data. The aggregate data are somewhat unusual in that they contain employment figures on the number of workers who were employed in the formal and informal sectors over the period 1970 to 1991. Likewise, the establishment data also contain employment information on workers in both the "covered" and "uncovered" sectors. Since the establishment data were collected both before and immediately after the implementation of the new legislation, they are ideal for measuring the change in employment associated with the rise in the minimum.

Several interesting results arise from the time-series and cross-sectional analysis. As predicted by standard theory, the minimum wage has significant, negative effects on formal sector employment. This result holds for both the aggregate and the establishment data. It is revealed that Ghanaian employment fell significantly in response to the government's minimum wage policies during the 1970s, 1980s, and early 1990s. Specifically, the 1991 minimum wage was associated with a 5 to 6 percent drop in total manufacturing employment. The impact of the minimum, however, was not the same across all firms. Results from the cross-sectional analysis indicate that firms that complied with the legislation fired approximately 2.5 more workers than firms that evaded the legislation. Moreover, there is some evidence to suggest that large firms increased employment after the rise of the minimum. Perhaps most important, the time-series analysis presents strong evidence that informal sector employment rose in response to Ghana's minimum wage policies. If we assume that there was no simultaneous shift in the relative demand for informal sector workers, this rise in the level of employment is likely to have caused a fall in informal sector wages. In other words, the analysis suggests that Ghana's minimum wage policy had the indirect effect of reducing the wages of those workers who could least afford it.

Given the fact that workers in the informal sector are usually among the most vulnerable workers in poor countries, it is important that studies which assess the impact of minimum wage legislation take into account the effects on workers in both the "covered" and the "uncovered" sectors. From the preliminary evidence presented in this study, it appears that minimum wage legislation can have a substantial impact on the level of informal sector employment in labor markets where displaced workers cannot afford to be unemployed. Thus, conventional models which assume complete coverage may not capture the full impact which minimum wages have on employment and wages.

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Table 1:
Real Minimum Wages in Selected African Countries

Country	1970	1975	1980	1985	1990
Algeria	56	69	100	.	.
Benin	.	143	100	91	.
Botswana	.	85	100	113	88
Burkino Faso	79	87	100	87	101
Congo	.	157	100	96	.
Cote d'Ivoire	104	114	100	84	79
Gabon	90	107	100	90	84
Ghana	415	509	100	144	114
Kenya	119	121	100	68	53*
Malawi	.	119	100	120	121*
Mauritius	.	.	100	104	110
Morocco	.	98	100	118	132
Niger	.	87	100	70	81
Senegal	99	111	100	78	78
Togo	143	131	100	80	80
Tunisia	.	77	100	110	100
Zaire	805	599	100	164	.

Source: Squire and Suthiwart-Narueput (1995). The original table has been amended by updating the 1990 figures. The 1990 figures for Burkino Faso, Gabon, Kenya, Malawi, and Mauritius are obtained from various ILO World Employment Reports. The figures with a * refer to the year 1989.

Table 2:
Real Minimum and Manufacturing Wages in Ghana, 1970-1991 (1990 Prices)

Year	Min. Wage	Public Sector Wage Floor	Avg. Manuf Wage	Min./ Avg. Manuf	Public Sector/ Avg. Manuf
1970	26223	10000	54101	0.48	0.18
1971	23863	10000	77364	0.31	0.13
1972	28320	13500	77364	0.37	0.17
1973	23863	16000	53560	0.45	0.30
1974	39334	18000	66003	0.60	0.27
1975	28583	18000	39333	0.73	0.46
1976	18880	13500	31250	0.60	0.43
1977	13374	11572	31857	0.42	0.36
1978	10489	10000	23538	0.45	0.42
1979	7080	7647	20941	0.34	0.37
1980	6556	6654	21231	0.31	0.31
1981	6818	8644	15311	0.45	0.56
1982	5379	6707	13568	0.40	0.49
1983	5242	5685	10581	0.50	0.54
1984	5141	6215	19441	0.26	0.32
1985	8545	10648	24573	0.35	0.43
1986	7723	11703	29000	0.27	0.40
1987	7411	13147	36143	0.21	0.36
1988	5552	13311	38098	0.15	0.35
1989	7861	11205	51031	0.15	0.22
1990	11960	9931	45045	0.27	0.22
1991	14913	10324	28451	0.52	0.36

Notes: All wages are monthly rates. The wage data are obtained from several sources. The minimum wage data are derived from Jamal and Weeks (1987), Rimmer (1992) and Berry (1994). Data from these sources correspond to the following years: Jamal and Weeks (1970 to 1981), Rimmer (1982 to 1988) and Berry (1989-1991). All the public sector wages are reported in Teal (1997). The average manufacturing wage rates are reported in various editions of the *Yearbook of Labour Statistics* (ILO).

Table 3:
The Impact of the Minimum Wage on Average Wages and Total Employment, 1970-1991

Dep. Variable:	(1) Ln Wages	(2) Ln Wages	(3) Ln (Emp/ Pop)	(4) Ln (Emp/ Pop)
constant	0.3863 (0.6297)	0.9713 (1.0936)	-0.4444 (0.2599)	4.9363* (0.0406)
Ln(Min)	-0.0945 (0.2487)	0.8143* (0.2848)	—	—
Ln(Min/Manuf)	—	—	-0.1180* (0.0419)	-0.1723* (0.0406)
Ln (Wages -1)	0.6342** (0.2687)	0.1374 (0.2220)	—	—
Ln GDP	0.0178 (0.0178)	0.1268 (0.1031)	-0.0048 (0.0227)	0.0030 (0.0152)
Ln GDP Deflator	0.2933 (0.3197)	-0.2673 (0.3540)	1.0508* (0.0699)	0.2711** (0.1286)
Ln Cocoa	-0.2007 (0.4812)	0.2735 (0.4105)	0.1591** (0.0730)	0.1827* (0.0456)
Ln Fertilizer	-0.2661 (0.1804)	-0.3716** (0.1415)	0.1089* (0.0326)	0.0896* (0.0238)
Structural Adjust. Dummy	0.4227 (0.2826)	-0.1143 (0.2697)	0.1429** (0.0635)	0.0906** (0.0374)
Trend	0.1222 (0.1025)	-0.0120 (0.0876)	0.0120 (0.0089)	0.0274* (0.0064)
Durban Watson	2.2047	2.137	2.059	2.015
Adj. R-squared	0.9924	0.9934	0.9928	0.9769

Notes: The minimum in columns 1 and 3 is the private sector wage floor; the minimum in columns 2 and 4 is the public sector wage floor. Columns 3 and 4 deflate the minimum wage by the average manufacturing wage. Durban Watson tests are performed on all regressions. The Prais-Winston (1954) estimator is used to correct for possible serial autocorrelation in all columns except 4. Standard errors are reported in parentheses. Statistical significance at the 1% level and 5% level is indicated by a * and **, respectively.

Table 4:
The Impact of the Minimum Wage on Informal Sector and Female Employment, 1970-1991

Dep. Variable:	(1) Ln(Inf/ Emp)	(2) Ln(Inf/ Emp)	(3) Ln(Fem/Emp)	(4) Ln(Fem/Emp)
constant	-0.0894	-1.1471	0.2613	0.0180
	(1.2857)	(0.7402)	(0.0300)	(0.0325)
Ln (Min/ Manuf)	0.0483	0.1389**	0.0060	0.0053
	(0.0370)	(0.0537)	(0.0054)	(0.0069)
Ln GDP	-0.0468**	-0.0270	0.0006	0.0005
	(0.0218)	(0.0204)	(0.0027)	(0.0027)
Ln GDP Deflator	-0.0223	0.1104	-0.1158*	-0.1135*
	(0.2010)	(0.1173)	(0.0083)	(0.0083)
Ln Cocoa	-0.3193*	-2941*	-0.0064	-0.0078*
	(0.0680)	(0.0561)	(0.0093)	(0.0094)
Ln Fertilizer	0.0070	-0.0355	-0.0075	-0.0077
	(0.0285)	(0.0307)	(0.0043)	(0.0049)
Structural Adjustment Dummy	-0.0586	-0.0608	-0.0085	-0.0076
	(0.057)	(0.0470)	(0.0083)	(0.0084)
Trend	0.0415*	0.0301*	-0.0016	-0.0018
	(0.0097)	(0.0085)	(0.0013)	(0.0014)
Durban Watson	2.0784	1.9726	1.4460	1.4599
Adjusted R-squared	0.9465	0.9617	0.9913	0.9913

Notes: The minimum in columns 1 and 3 is the private sector wage floor; the minimum in columns 2 and 4 is the public sector wage floor. All columns deflate the minimum wage by the average manufacturing wage. The dependent variable is defined as informal sector employment divided by total employment in columns 1 and 2. Similarly, the dependent variable is defined as female employment divided by total employment in columns 3 and 4. Durban Watson tests are performed on all regressions. The Prais-Winston (1954) estimator is used to correct for possible serial autocorrelation in columns 2 , 3, and 4. Standard errors are reported in parentheses. Statistical significance at the 1% level and 5% level is indicated by a * and **, respectively.

Table 5:
Definitions and Descriptive Statistics of the Establishment Data

Variable	Definition	Mean	Std. Dev.
dE	Full-time Employment (excludes apprentices)	2.1043	21.3334
Minw	Real minimum wage deflated by the unskilled wage at firm I		
Gap	The proportionate increase in unskilled wages at firm I needed to attain the minimum	0.9193	3.2397
Coverage	Equals one if the unskilled wage at firm I exceeds the minimum	0.6261	0.4860
Accra	Equals one if the firm is located in the capital city, Accra; zero otherwise	0.6087	0.4902
Kumasi	Equals one of the firm is located in the capital of the Ashanti region, Kumasi; zero otherwise	0.3043	0.4621
Food	Equals one if the firm has a SIC classification of 311; zero otherwise	0.2870	0.4543
Bevs	Equals one if the firm has a SIC classification of 312; zero otherwise	0.0174	0.1312
Garm	Equals one if the firm has a SIC classification of 322; zero otherwise	0.1217	0.3284
Wood	Equals one if the firm has a SIC classification of 331; zero otherwise	0.0696	0.2553
Furn	Equals one if the firm has a SIC classification of 332; zero otherwise	0.2714	0.4143
Metal	Equals one if the firm has a SIC classification of 381; zero otherwise	0.2348	0.4257
Machinery	Equals one if the firm has a SIC classification of 382; zero otherwise	0.0348	0.1840
Union	Equals one if the firm is unionized; zero otherwise	0.2957	0.4583
KL	Capital-labor ratio in 1990 prices	297.18	642.06
Informal	Equals one if the firm uses on hand tools; zero otherwise	0.1652	0.3730

Source: RPED Data.

Table 6:
Change in Employment at the Establishment Level

Indep. Variables:	(1)	(2)	(3)	(4)
Minw	-2.9896* (0.6113)	—	-3.0732* (0.7393)	—
Gap	—	-2.8093* (0.5603)	—	0.2879* (0.6754)
Controls for Region	no	no	yes	yes
Controls for Industry	no	no	yes	yes
Controls for capital-labor ratio	no	no	yes	yes
Includes informal sector dummy	no	no	yes	yes
Adjusted R-squared	0.1674	0.1748	0.1219	0.1285

Source: RPED Data.

Figure 1: Employment Effects of a Minimum Wage in a Competitive Labor Market

Wage

W_m

W_0

S

D

E_m E_0 S_m Employment
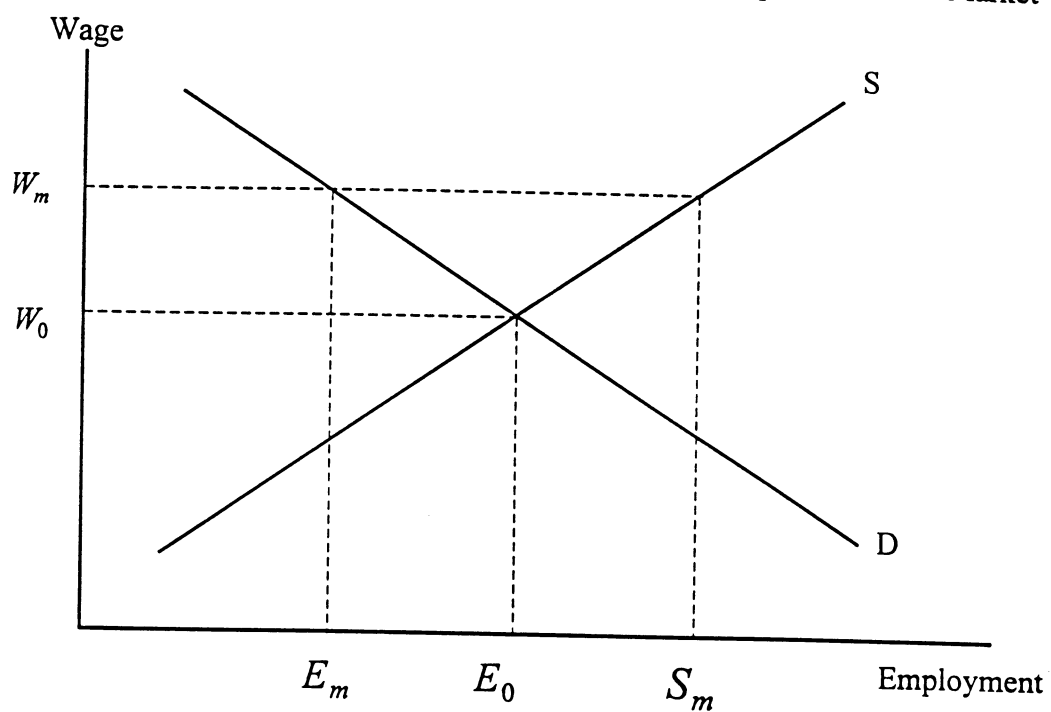
Figure 2: Employment Effects of a Minimum Wage in a Labor Market Where There is a Monopsony

Wages

MC

S

W_1

W_0

D
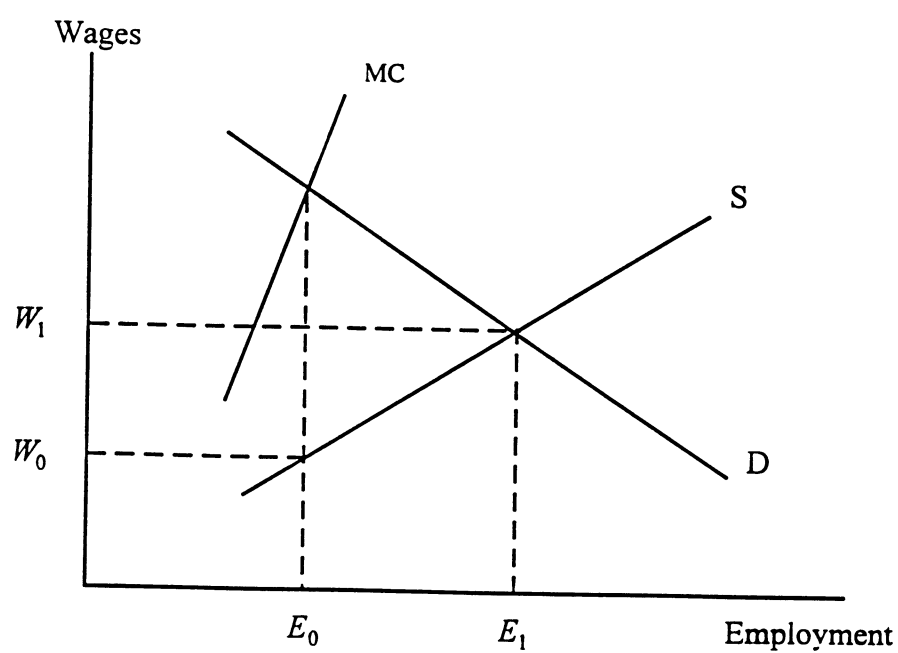
E_0 E_1 Employment

Figure 3: Employment in a Dualistic Labor Market with Flexible Wages and Perfect Mobility

L_F^d L_I^d

W_0 - W_0

0_F E_0 0_I
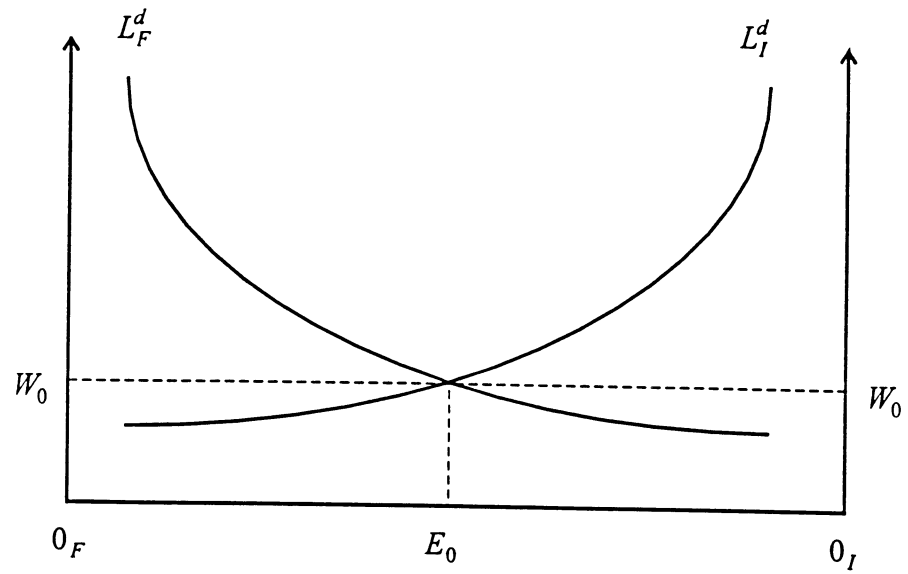
Figure 4: Minimum Wage Effects in a Dualistic Labor Market with Flexible Wages and Perfect Labor Mobility

L_F^d L_I^d

W_F -

W_I

O_F E_C E_0 S_C O_I
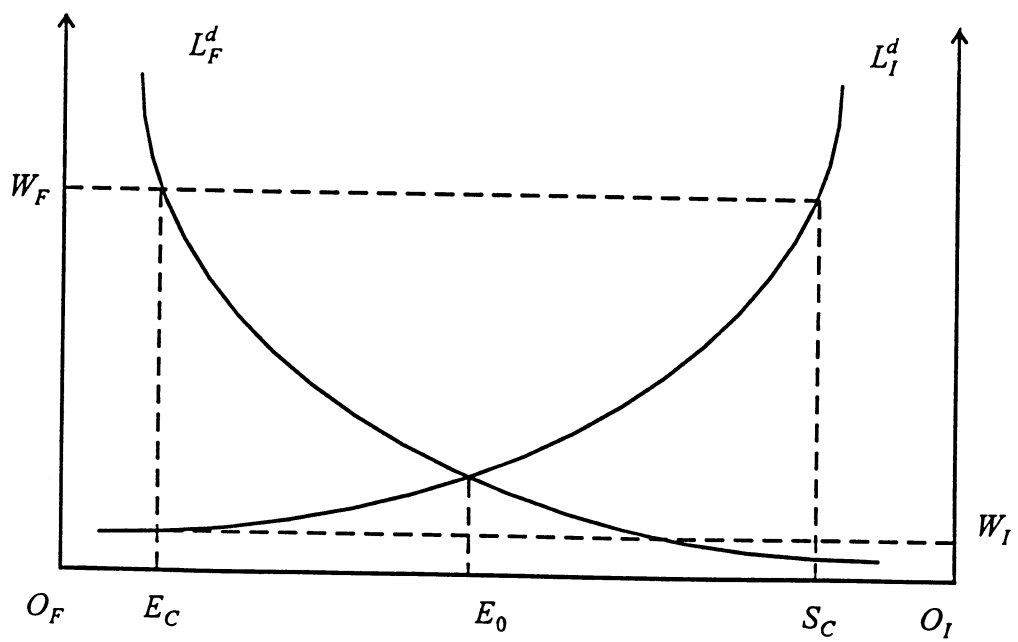
Figure 5: Minimum Wage Effects in a Dualistic Labor Market with Flexible Wages and No Labor Mobility
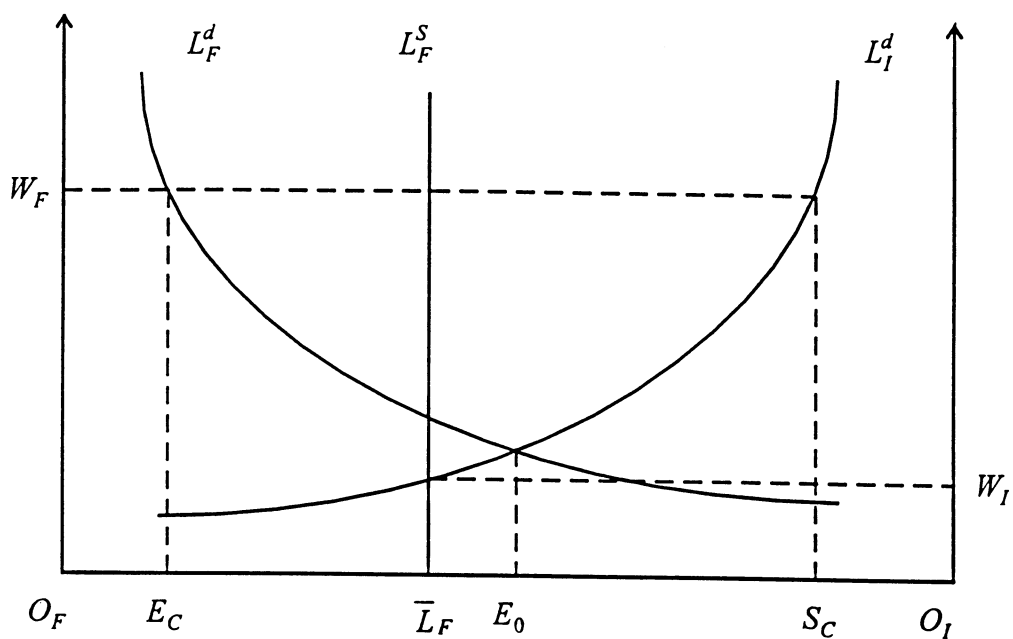
Figure 6: Minimum Wage Effects in a Dualistic Labor Market with Flexible Wages and Partial Labor Mobility (Monopsony Case)

Figure 7

Real Minimum Wage Index (1970=100)

Figure 8

Real Public Sector Wage Floor Index (1970=100)

Figure 9

Comparison of Real Minimum and Average Manufacturing Wages

Real Minimum Wage (1990 Prices) — — Real Average Manufacturing Wage (1990 Prices)

0

14913
wages
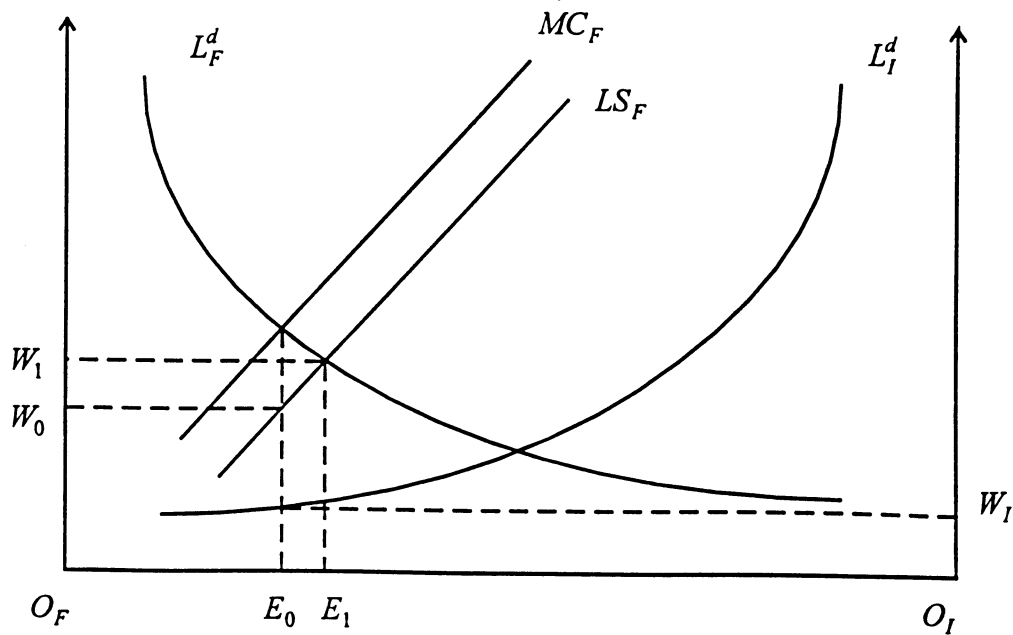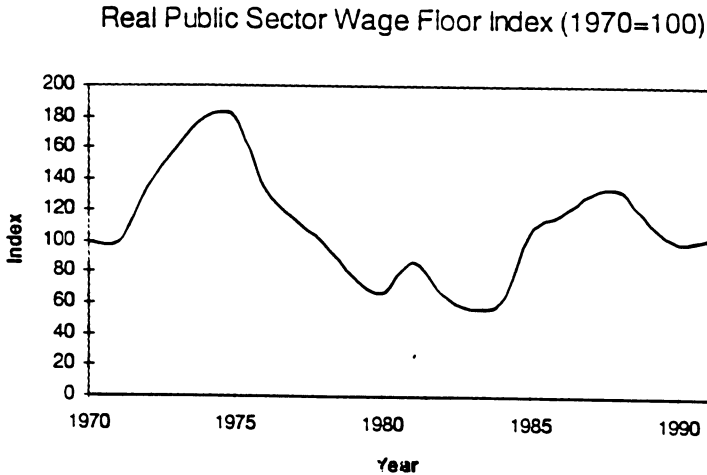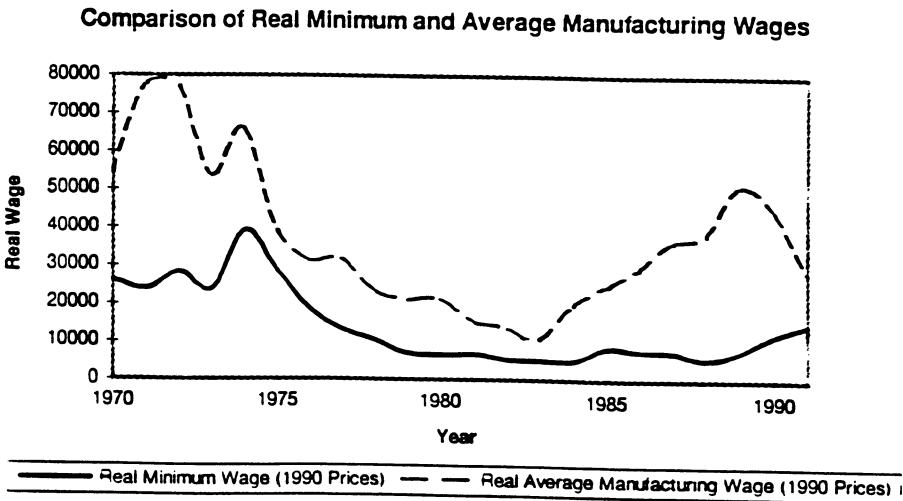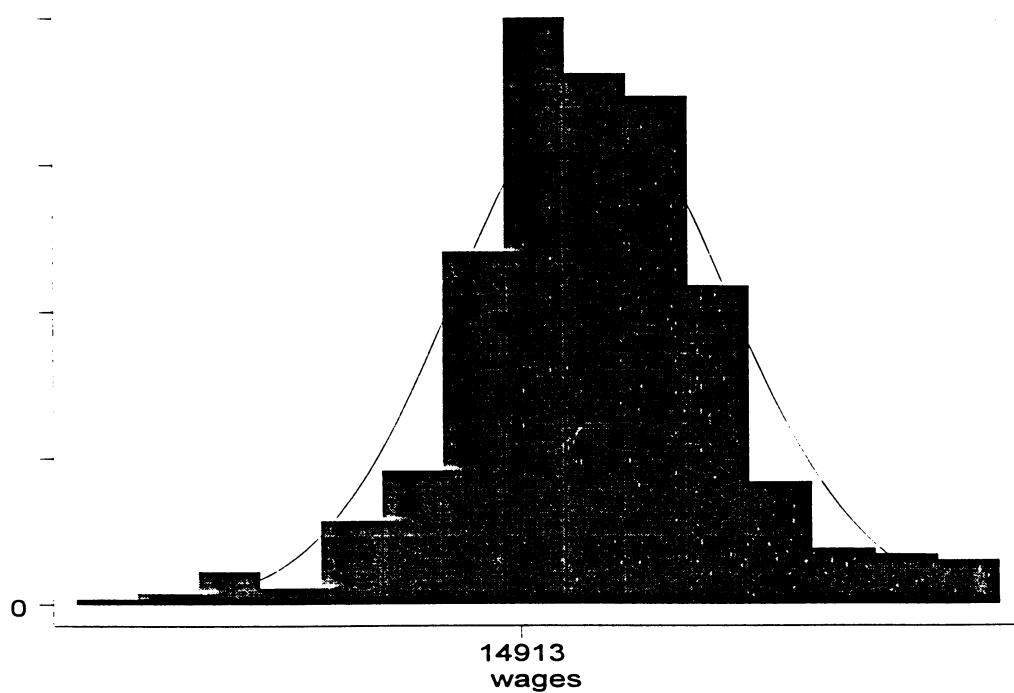
Figure 10: All Manufacturing Workers

0

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wages
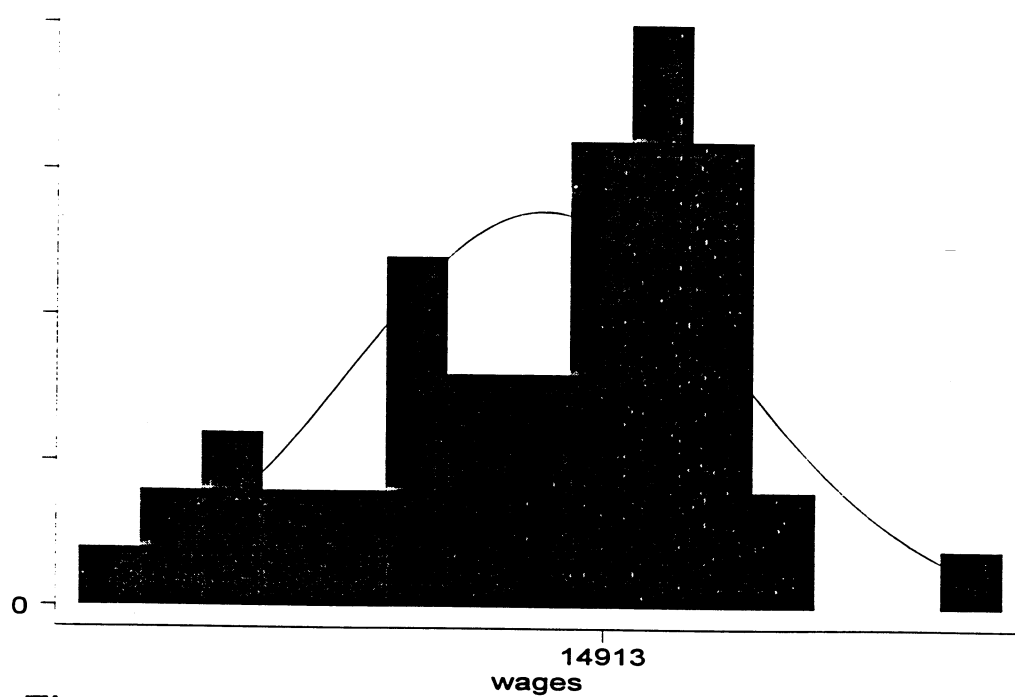
Figure 11: Workers in Informal Sector Firms

0

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wages
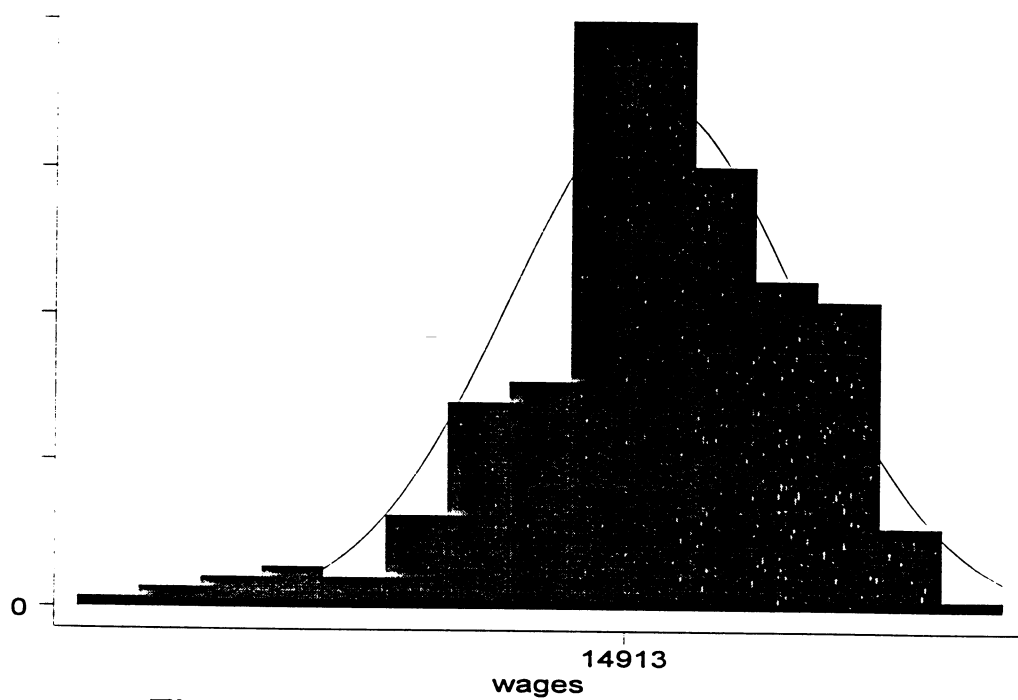
Figure 12: Production Workers

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14913

wages
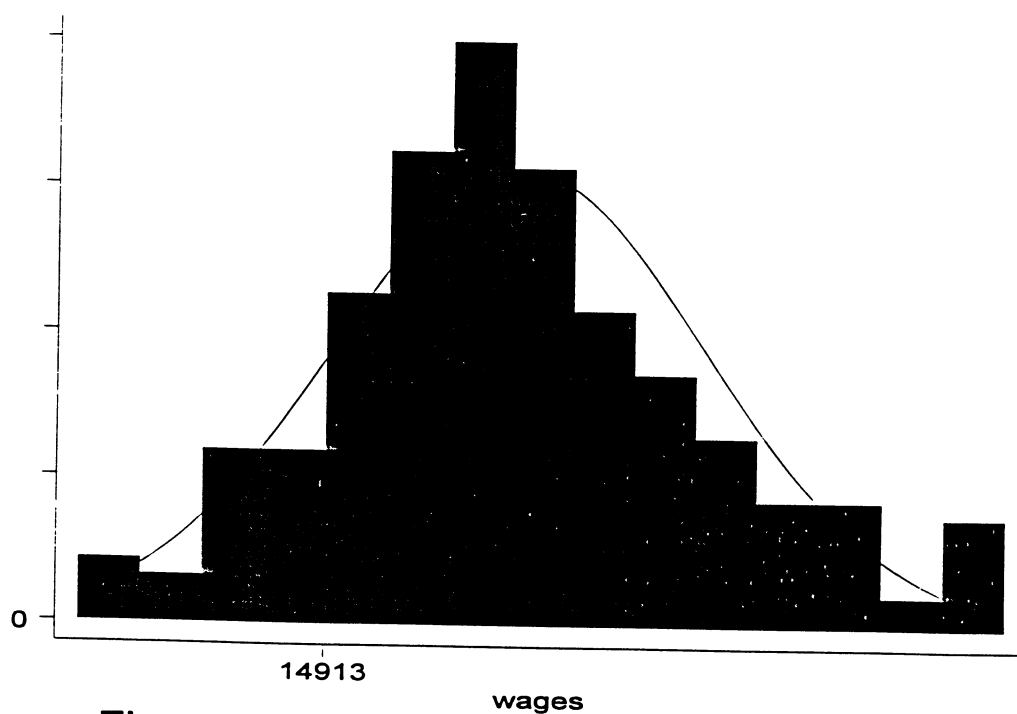
Figure 13: Non-Production Workers

0

14913

wages
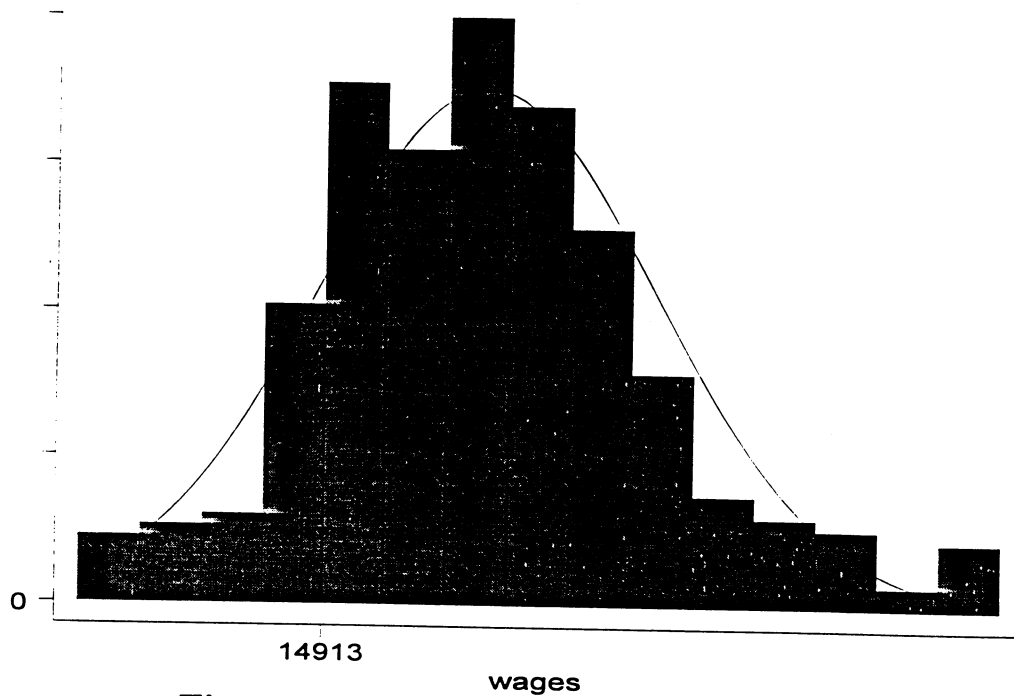
Figure   14: Union Workers

0

14913

wages
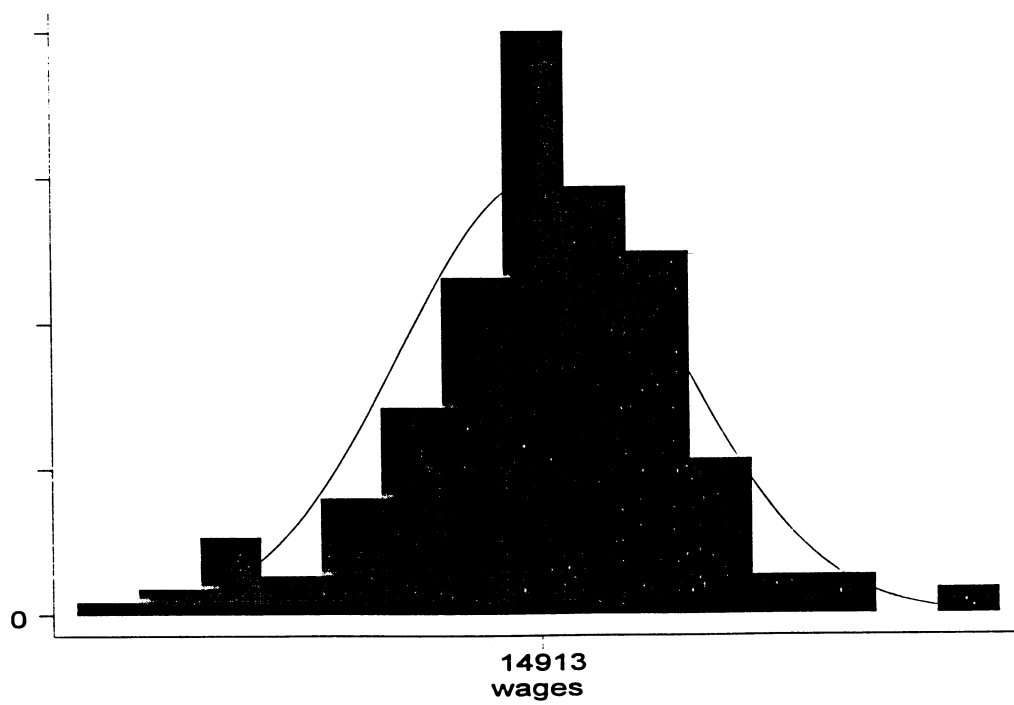
Figure 15: Non-Union Workers

0
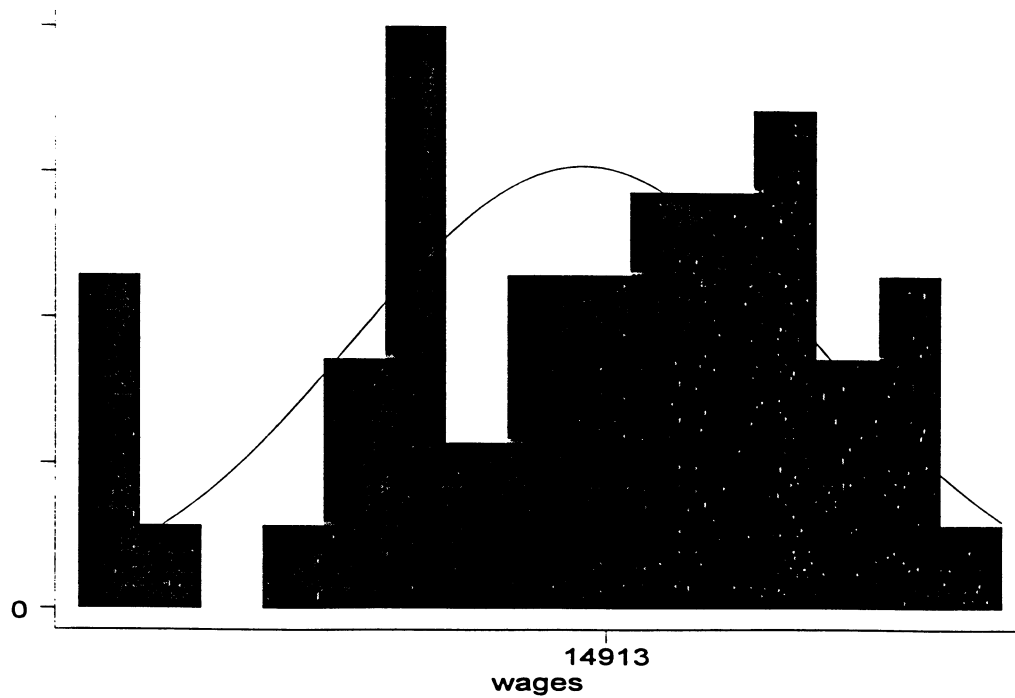
14913
wages
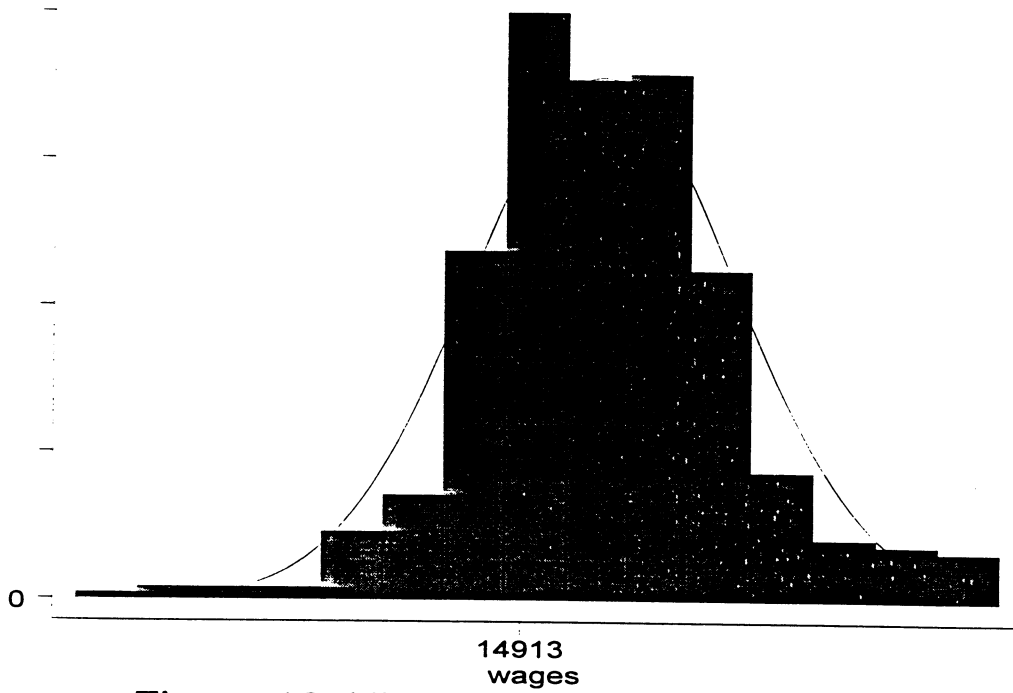
Figure 16: High-Skilled Workers

0

14913
wages

Figure 17: Low-Skilled Workers