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**When Does FDI Have Positive Spillovers? Evidence from 17 Emerging
Market Economies**

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WHEN DOES FDI HAVE POSITIVE SPILLOVERS? EVIDENCE FROM 17 EMERGING MARKET ECONOMIES

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Abstract

We use firm-level data and national input-output tables from 17 countries over the 2002-2005 period to test new and existing hypotheses about the impact of foreign direct investment (FDI) on the efficiency of domestic firms in the host country (i.e. spillovers). Providing evidence from a larger sample of countries and greater variety of firms than existing studies, with separate estimates by firm size, age, and sector, we show: a) backward spillovers (stemming from supplying a foreign firm in the host country or exporting to a foreign firm) are consistently positive; b) horizontal spillovers are mostly insignificant but positive for older firms and firms in the service sector; c) forward spillovers (from purchasing foreign firms or importing) are also positive only for old and service sector firms. We find no support for the hypothesis that spillovers are greater for FDI with more advanced technology. While efficiency of domestic firms' is affected by the business environment, the strength of FDI spillovers is not, either when measured by the degree of corruption, bureaucratic red tape or by differences across regions that vary in terms of development. Testing whether spillovers vary with the firm's "absorptive capacity" we find: i) distance from the efficiency frontier tends to dampen horizontal spillovers in manufacturing and backward spillovers among old firms; ii) whereas firms with a larger share of university educated workforce are more productive, they do not enjoy greater FDI spillovers than firms with less educated workers. FDI spillovers hence vary by sectors and types of firms.

1. Introduction

This paper examines the role of minimum wage legislation in reducing poverty in Honduras. The justification for minimum wage legislation is to redistribute income to low wage workers.[1] This policy tool can be especially important in developing countries during periods of rapid adjustment to the global economy. However, in an era when global competition is very strong, several policy makers are arguing for reductions in (and even the abolition of) minimum wages (and other labor market regulation) in Latin America to allow for more labor market flexibility and increased competitiveness (see e.g., Heckman and Pages, 2003). The main argument is that rigidities in the labor market, such as wage rigidity caused by the minimum wage, can slow down job creation and in turn contribute to unemployment and poverty (see e.g., Kowan, Micco and Pages 2004). On the other hand, fierce competition in the globalized world is also creating an environment that some have termed "the race to the bottom." This group is concerned that wages and working conditions are being driven down by global competition and there is a need to uphold the bottom with regulations such as the minimum wage and labor standards. Acemoglu's (2001) theoretical model, which shows that minimum wages can shift the composition of employment toward high-wage jobs, could be used in support of this latter view. Hence, increases in minimum wages could contribute to the reduction of poverty by increasing the incomes of those affected by the legislation and perhaps even increasing the share of higher wage jobs in the economy.

We take advantage of the enormous variation in the minimum wage structure of a relatively poor country to examine minimum wage effects on poverty during the 2001-

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[1] See Freeman (1996) for an enlightened discussion of the minimum wage as a redistributive tool.

2004 period.[2] Honduras has set over 22 minimum wages, by industry and firm size, for decades. These legal minimum wages apply to all employees in the private sector, although we present evidence that they are complied with only in large private firms and not in small private firms. There is also a large group of workers (the self-employed and public sector) for whom minimum wages do not apply directly, but whose wages and employment can be affected indirectly either through the mobility of workers across sectors in response to changes in the minimum wage or through institutions, such as unions, that try to emulate the minimum wage increase in their sector's wages. We combine micro data from the household surveys with data on minimum wages to determine whether increases in the minimum wage affect the probability that a typical individual in the labor force, as well as different types of workers in both the covered and uncovered sectors are poor.

We find that minimum wage increases do reduce extreme poverty: A 10% increase in the minimum wage will reduce the probability that an average individual in the labor force is in extreme poverty by 1.8% (i.e., from 44.0% to 43.2%) and in poverty by 1.0% (although this latter finding is close to but not statistically significant by conventional levels). These results are driven entirely by the effect on workers in large private sector firms, where a 10% increase in the minimum wage reduces extreme poverty and poverty by 2.0% and 1.9%, respectively. Increases in the minimum wage do not seem to affect the net probability of being poor for individuals employed or previously employed in a small firm, or as self-employed or in the public sector.

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[2] The period of analysis is circumscribed by the fact that micro data on poverty is not available until 2001.

2. Theoretical Considerations and Empirical Literature

The minimum wage as a poverty reducing tool is problematical for a number of reasons. To begin with, it is difficult to predict the effect of the minimum wage on the wages and employment of workers to whom the law applies. As Freeman (1996, p. 639) notes "The goal of the minimum wage is not, of course, to reduce employment, but to redistribute earnings to low-paid workers." Yet, most of the literature has found negative employment effects (see Brown, 1999 and Neumark and Wascher, 2006 for reviews of the evidence). There are a few studies using data from the US (Card and Krueger, 1994 and 1995) and the UK (Machin and Manning, 1994) that have found no or positive employment effects. If minimum wages have no disemployment effects, as the monopsonistic model predicts, then minimum wage increases will certainly raise the incomes of low wage workers. However, if the labor market is competitive, some workers lose their jobs while others retain them at a higher wage. Moreover, if the elasticity of demand for labor in the covered sector is high (greater than 1), minimum wages will reduce the share of total earnings to low-paid workers by displacing a larger number from employment than the number whose wages are raised by the minimum wage.[3] Whether the displaced worker's earnings fall below the per capita poverty level is of course a function of a number of variables including, the existence and generosity of the social safety net, the flexibility of the labor market, the demand for the workers' skills, etc. There are, of course, other ways that workers covered by minimum wage legislation can gain or lose from increases in the minimum wage, including adjustments

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[3] See Neumark and Wascher (2002, pp. 316-318) for an extensive discussion of the assumed elasticities in the literature and the actual measured elasticities for affected workers.

in hours worked, reduction in non-wage benefits, and spillover effects.[4] If workers above the minimum also gain from minimum wage increases, then there can be larger positive income effects on low-wage workers.[5]

A second set of issues to consider is the indirect effect of minimum wage increases on workers not covered by minimum wages (or sectors where there is no compliance with minimum wage legislation). Minimum wages can indirectly contribute to poverty creation in the uncovered sector if workers who lose their job in the covered sector greatly increase their labor supply to the uncovered sector, lowering wages below the per capita poverty line. In this two-sector competitive model of the labor market, the final effect on the uncovered sector will depend on the elasticities of labor demand and supply in both sectors. However, if there are institutions, such as unions, which try to garner the level and increases in minimum wage in the uncovered sector, then reductions in poverty of families of workers in the uncovered sectors might be an outcome.

In considering the potential for minimum wage policy to reduce poverty, we must recognize that poverty is a function of a worker's family income, which raises a third set of issues: It requires addressing whether low-wage workers are in low-income families. Hikes in the minimum wage that raise the incomes of low-wage workers will only reduce poverty to the extent that those workers are in low-income families. Gramlich (1976) was one of the first to note that minimum wage workers can live in relatively affluent families. More recently Burkhauser et al. (1996) showed that only one-third of the workers in the US affected by the 1990 minimum wage increase were in poor or near

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[4] See Brown (1999) for a full discussion of the many adjustments in the labor market that can result from an increase in the minimum wage.

[5] Fajnzylber (2001) and Maloney and Núñez (2003) have found large spillover effects in Latin American countries.

poor families. (Another third of the workers were in families with incomes more three times the poverty line.)

A related issue is that the impact of minimum wages can have different effects on family income depending on who in the household is affected and how they respond. For example, one could envision scenarios where increases in the minimum wage could bring a family out of poverty if a secondary earner decides to join the labor force because the wage increase is above her reservation wage (Addison and Blackburn, 1999; Freeman, 1996). However, an increase in the minimum wage might also cause a family to fall into poverty if it is the head of the household who looses his or her job as a result of the increase (and other members are not able to increase their hours of work or find a job if not working). Which workers gain and which loose can also influence whether the family's income is above or below the poverty line.

Finally, a fourth factor to consider is the relative level of the minimum wage to the per-capita poverty line.[6] One might expect that raising the minimum wage could have a bigger effect reducing poverty if the minimum wage is set at or below the per-capita poverty line than if it is set at four times the per capita poverty line. However, the relative level of the minimum wage to the per-capita poverty line also reflects the government/society's view as to whether the minimum wage is meant to cover the basic needs of a worker or a family. It is also a function of the extent to which families are expected to rely on one vs. two bread-winners. For example, if the society believes that the minimum wage should cover only the basic needs of a worker, a family of four with

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[6] See Fields and Kanbur (2006) for a theoretical treatment of the impact of minimum wages on poverty reduction which focuses on four parameters: the elasticity of labor demand, the ratio of the minimum wage to the poverty line, the extent of income sharing in the household and the degree of poverty aversion.

only one household member earning the minimum wage will be poor; raising the minimum wage in this scenario would have no impact on poverty reduction. On the other hand, if the minimum wage is meant to meet the basic needs of a family, then raising the minimum wage in this scenario is more likely to reduce poverty.

Because of all these factors, it is difficult to predict what the consequences of a minimum wage increase are for poverty and the distribution of family incomes. We turn to the empirical literature on this question, which unfortunately is sparse in comparison to the literature on the wage and employment effects.

Card and Krueger (1995) provide one of the first estimates of the effect of minimum wages on poverty in the US. They regress the change in a state's poverty rate from 1989 to 1991 on the fraction of the state's workers that are "affected by" the minimum wage increase in 1990-1991 and provide some weak evidence (mostly insignificant) for a modest poverty reducing effect of the minimum wage.[7] Addison and Blackburn (1999) also use state panel data and a methodology similar to Card and Krueger's (1995), however they use a longer time frame (1983-1996) and focus on low wage families. They find that increases in minimum wages reduce the poverty level among teenagers and junior high school dropouts. However when they analyzed the relationship separately for the 1980s and 1900s, they found it is only statistically significant in the 1990s.[8] Neumark and Wascher (2002) have recently contributed to the literature with a study that goes beyond estimating the net effects by measuring flows into and out of poverty. They present evidence using US CPS data that increases in the

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[7] The 'fraction affected' was the share of workers whose wage was between the minimum wage in 1990 and the new minimum wage in 1991.
[8] Their search for explanations of the different outcomes in the 1980s and 1990s did not come up with anything conclusive.

minimum wage raises both the probability that some poor families escape poverty and the probability that some previously non-poor families fall into poverty. They conclude that the combined evidence indicates a redistribution of income among the poor rather than from the non-poor to the poor.

Several studies have examined the effect of minimum wages on poverty in developing countries, mostly in Latin America. Studies using aggregate country data tend to find minimum wage increases reduces poverty. For example, Morely (1995), using data for Latin American countries, finds that poverty falls with an increase in the minimum wage during upswings in the business cycle by not during recessions. Lustig and McLeod (1996) regress changes in poverty indicators (using alternative measures) in Latin American and Asian countries on their minimum wage changes (controlling for other variables associated with changes in poverty) and find higher minimum wages are associated with lower levels of poverty in both regions, whether the economy was growing or declining, and the population was urban or not. However, they also find that minimum wage increases raise unemployment and hence they do not endorse minimum wages as an effective policy measurer to reduce poverty. Saget (2001) uses data on a cross section of countries and finds a negative and significant relationship between the level of poverty (using a national poverty line) and the level of the minimum wage (in dollars), after controlling for the GDP/capita, average wage in manufacturing and location. However, the results from a subset of countries where the regression could be run using the US$1 or US$2 a day international poverty line show no significant correlation. Sagat (2001, p. 22) concludes that "This result confirms our intuition that

minimum wages in developing countries do not affect the poorest share of the population, but rather the upper levels of the low-income population."

Whereas the country-level studies in developing economies have a fairly consistent message, studies using micro data do not always find that poverty falls with a rise in the minimum wage. For example, IPEA's (2000) simulations using Brazilian micro-data find that an increase in minimum wage has no effect on poverty, once the unemployment effects of the minimum wage increase are taken into account. Arango and Pachon's (2004) study, using Colombian panel data on urban areas, finds minimum wages improve the living conditions of families in the middle and upper part of the income distribution with net losses for those at the bottom. They also find significant negative minimum wage effects on both the likelihood of being employed and hours worked, especially for women, the young and less educated workers. On the other hand, Cunningham and Siga (2006) find that that minimum wages increases household earnings among the poor and that the poorest households experience the highest wage gains in Mexico. The World Bank (2006) attributes the difference in Arango and Pachón's (2004) and Cunnigham and Siga's (2006) findings for Colombia and Mexico, respectively, to the fact that minimum wages are relatively low in Mexico and relatively high in Colombia.

The Arango and Pachón (2004) and Neumark, Cunningham and Siga (2006) studies also begin to explore the impact of the minimum wage on the labor supply responses of different members of the household by examining separately the probabilities of employment and the change in the hours worked of the heads v. non-heads of households. Arango and Pachón (2004) find that an increase in the minimum wage relative to the median wage reduces the likelihood that a household head is

employed; this negative effect is larger for women and less educated people. Although the findings for non-heads are not directly comparable to those for heads, since they are estimates of unemployment and participation in the labor force which are conditioned on the number of family members in the labor force, the authors claim that increases in the ratio of the minimum wage the median raises the probability of unemployment of non-heads and also increases their probability of participation in the labor market, which the authors interpret as a "third-bread-giver response to negative family income shocks" (p. 24).

Hence the sparse literature on minimum wages and poverty has provided inconclusive evidence on the question of the impact of increases in the minimum wage on the level of poverty. Most of the evidence is of reduced form with estimates of the correlation between (changes in) poverty and (changes in) the minimum wage. The older studies, using country level data, were more likely to find a negative relationship between minimum wage hikes and poverty than the more recent studies based on micro data. Some recent students are beginning to look more at the structural relationships and providing us with a richer understanding of the household responses to minimum wage increases.

3. Minimum Wages and Poverty in Honduras

During the period under study, Honduras set 22 minimum wages -- for small (1-15 employees) and large (16+ employees) firms in eleven industries -- and adjusted them about two times a year.[9] These minima applied to all salaried employees in the private

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[9] The information on the structure of minimum wages was gathered from interviews with staff at the Ministry of Labor and Social Security in Honduras and from a report by the Secretaria de Trabajo y Seguridad Social (2003).

sector; hence the public sector and the self-employed are the "uncovered sector."[10]

Appendix Table A1 summarizes the data on minimum wages from the decrees that we use in our analysis. These are daily minimum wages deflated to December 1999 prices using the monthly Consumer Price Index provided by the Bank of Honduras. In our empirical work we use all 22 minimum wage categories. We note that the minimum wage for large firms was on average 27% higher than the minimum for small firms during this period and that the rate of growth of real minimum wages was more rapid for small firms (4% per year) than for large firms (1% per year). Hence over the period, minimum wages for small firms rose by 11.9% while for large firms they only rose by 3.3%.

The second data set we use is the Permanent Household Surveys for Multiple Purposes (PHSMP), which is a nationally representative survey that was carried out two times a year (in May and September) during 2001-2004. These surveys provide information on the economic activity, firm size and location of each person's job, which allowed us to append to each worker and each unemployed person who has worked before the minimum wage that corresponds to his/her job in a given month and year.[11]

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[10] A separate wage grid applies to public sector employees who are not covered by union agreements. Among the unionized civil servants, there are two groups (medical staff and teachers) whose base wage has at times been adjusted with a formula tied to minimum wage adjustments.

[11] Unfortunately, we are not able to assign a minimum wage to those outside of the labor force or to unemployed workers who have never worked before because we do not know the firm size and industry of their job; the applicable minimum wage depends on these two characteristics of the job. However, since the unemployed who worked before are on average over three-quarters (76%) of all unemployed during the period under study, our results represent the vast majority of the unemployed.

The daily minimum wages were converted into monthly and hourly minimums in order to have them in the same units as the salary data in the PHSMP.[12]

In order to get a sense of the variation in the real minimum wage over time in relation to the real wage, we plot in the first graph (upper left quadrant) of Figure 1 the average real minimum wages and wages (in Lempiras, December 1999 prices) of all private sector employees for each survey date during 2001-2004.[13] The average real hourly minimum wage increased by 3.8% per annum on average or 10.9% from May 2001 to May 2004.[14] We also see that the minimum wage is relatively high -- between about 0.45 and 0.56 of the average wage -- during 2001-2004.

The graphs in the lower half of Figure 1 are presented to show that Honduras was enjoying a period of relatively stability and growth after the destruction created by Hurricane Mitch in 1999. Inflation ranged between 6.0% and 9.6% and GDP was growing at an average annual rate of about 4.3%, without any significant shocks.

Honduras is a relatively poor country. With a GNI per capita of US$1,040 in 2004 (World Bank Indicators), it is the fourth poorest country in Central America (but

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[12] According to the Directorate of Salaries in the Ministry of Labor, employers are required to pay 30 daily MWs in a month. We calculated an hourly minimum wage = Monthly MW/(4.3 x 44), which assumes an average of 4.3 weeks a month and that full time work is 44 hours a week. (In Honduras, full-time work for private sector employees is defined in the labor code as 8 hours a day for five days plus one half-day on Saturday.) The hourly wage was calculated by dividing the monthly salary (provided in the PHSMP) by the number of hours the worker indicated he/she had worked per week times 4.3 (weeks/month). (Observations with missing data on any of the key variables -- labor earnings, hours worked, sector, etc. -- were deleted.)

[13] These minimum wages are averaged over all private sector employees, hence over large and small firms and over the 10 industries in the PHSMP.

[14] However, the annual increases in the average real minimum wage are more erratic and very different when using May to May annual changes (15.1% increase between 2001 and 2002; a 5.9% decline in 2002-2003; and a 2.3% rise in 2003-2004) than when using the September to September annual changes (0 changes between 2001 and 2002 and 6.5% increase between 2002 and 2003). This is of a function primarily of when the minimum wage was last raised and how much inflation there was in the interim, and to a lesser extent to changes in the distribution of workers across industry and firms size.

very close to Nicaragua, the poorest country). It has the highest poverty headcount ratio in the region, which has remained fairly constant since 1990 (Trejos and Gindling, 2004). Since 2001, micro data have been available on two levels of poverty -- poverty and extreme poverty -- from the household surveys (PHSMPs). The extremely poor poverty line is constructed from the cost of a basic basket of foodstuff yielding 1,200 calories a day. A household is considered extremely poor if its per capita earnings are less than the cost of this basic basket of food. The poverty line is constructed from a basic basket of goods that includes housing and education services in addition to the basic basket of food.

To get a sense of the levels poverty and its trend in Honduras, we present in the upper right quadrant of Figure 1 a bar graph with the shares of the labor force which fall in each of three categories – extremely poor, poor and non poor – at each of the survey dates from 2001 to 2004. The average shares, over the entire period, are in the bottom row of Table 1. As can be seen, a very large percentage of the labor force in Honduras -- on average 44% -- is considered extremely poor, with 63% (an additional 19%) considered poor, leaving only about 37% of the work force as non-poor. The bar charts in Figure 1 indicate that over these four years, these shares are fairly constant, with only small fluctuations around the mean.

We also show in Table 1 the unconditional probability that different groups of individuals in the labor force are poor. The rates of extreme poverty are highest among those working in small firms, 46%, or self-employed, 51% (which together account for almost three-quarters of the labor force); workers and unemployed who are unskilled, 49% (two-thirds of the labor force); young people between 15 and 21 years of age, 50%

12

(which account for one-quarter of the labor force); and individuals living in rural areas, 62% (almost half of the labor force). Although these patterns are typical, the gap between the urban and rural extreme poverty rates is remarkably large in Honduras. We note that the measure we present here is comparable but not equivalent to the poverty head count measure, which measures the share of the population below the poverty line.

How high is the minimum wage relative to the household per capita poverty line? At 3.5 times the poverty line, the World Bank (2006) ranks Honduras' ratio of the minimum wage to the per capita poverty line as third out of 20 Latin American and Caribbean countries, with Guyana being the highest (6.5 times the poverty line) and Chile the second highest (at about 3.8 times the poverty line). We noted earlier that if the minimum wage is set high relative to the poverty line, then raising it may have no impact because it is raising the income of the middle (a bit like the findings of Arango and Pachón, 2006, for Colombia). In Honduras a minimum wage earner could provide a household with three dependents with the basic needs above the poverty. However, in a country where the female labor force participation rate is low and the average family size is large, this minimum would not necessarily cover the basic needs of the typical family of five if there were only one income earner. Hence, there is scope for a reduction in poverty from raising the minimum.[15]

Finally, we noted that in the US literature there is a concern that individuals who earn the minimum wage are not in poor households. Hence we calculate the share of workers who earn within 10 percent of the minimum wage (i.e., 0.9MW<W<1.1MW) that are poor. We note from Table 2 that 71% of all workers who earn the minimum

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[15] The World Bank (2006) study notes that at $7/day the Honduran poverty line is also far above the $2/day poverty line and that three countries (Venezuela, Mexico and Uruguay) out of twenty Latin American and Caribbean countries have minimum wages that are below this poverty line.

wage are in poor households, which indicates that raising the minimum wage could have a substantial effect on poverty.[16] We list the probabilities for various groups in the population and see that raising the minimum wage for household heads, unskilled, men and older individuals could potentially lift more families out of poverty than raising it for the non-heads, skilled, women and younger people.

4. The Impact of the Minimum Wage on the Distribution of Wages

A straightforward method of looking for an impact of minimum wages is to look for spikes in the wage distribution at or around the minimum wage (e.g., Dinardo, Fortin and Lemieux, 1996). However, given the number of minimum wages in Honduras, we simplify the graphical analysis by plotting the kernel density estimate of the log wage minus log minimum wage for each worker, where a zero indicates that the worker is earning the legal minimum wage. In Figure 2 we plot these kernel density estimates separately for four sectors: two covered (the large firm and the small firm sectors) and two sectors not formally covered by minimum wage legislation (self-employed and the public sector). If legal minimum wages are enforced in a particular sector, we would expect to see the distribution of wages censored from below at the level of the minimum wage, with no (or very few) workers earning below the minimum wage. We might also expect to see a density at zero (at the minimum wage) to be higher in the covered sector than in the uncovered sector. This is what we find in the kernel density estimates in the top left panel of Figure 2 for covered workers in large firms: there is a large spike at the minimum wage and there is a clear censoring of the distribution below the minimum wage. On the other hand, the distribution of wages in the small firm covered sector is not

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[16] We note from Table 1 that the average individual in the labor force has a .63 probability of being poor in Honduras, and the probability is higher for those earning the minimum wage.

14

censored and there is no spike at the minimum. The shape of the distribution of wages in the small firm covered sector is more similar to the shape of the distribution in the uncovered self employed and public sectors. In these three sectors, there is no indication that minimum wages affects the distribution of wages, and therefore we conclude that minimum wages are not effectively enforced in the small firm covered sector, self-employed sector or public sector.

Another way to summarize the information presented in Figure 2 is to calculate the average share of workers earning less than, at, or more than the MW within each of these four sectors, as we do in Table 3.[17] We find the share at the MW is substantially higher among private sector employees in large firms (12.4%) than among private sector employees in small firms (9.7%), among the self employed (7.1%) or in the public sector (5.3%), again pointing to higher enforcement in the large firm private sector. Similarly, we find relatively fewer workers earn less than 90% of the minimum wage in the large firm covered sector (16.9%) than in the small firm private sectors (39.8%). Additionally, we find no evidence that minimum wages directly affect the distribution of wages in the self-employed or public sector. Hence the combined evidence of the wage distribution and the average share earning below and at the minimum wage point to better enforcement of minimum wages in the large firm covered sector than in small firms, where we might conjecture there is little to no enforcement.

In a companion paper (Gindling and Terrell, 2006) we use an industry-level panel data set to estimate the wage and employment effects of changing minimum wages in Honduras. In that paper we find that increases in the minimum wage are correlated with

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[17] We use a bound of 10% to allow for measurement error so that we are actually measuring the share earning less than 0.9 of the MW, within 0.9 and 1.1 of the MW and more than 1.1 of the MW.

15

higher average wages in the large firm covered sector (our estimates suggest that a 10% increase in legal minimum wages will increase average wages in the large covered sector by 2.1%). At the same time, higher minimum wages reduce employment in the large firm covered sector (we estimate that an increase in real minimum wages of 10% reduces employment by 5.3%). Where do the workers who lose their jobs in the large firm covered sector go? Our evidence suggests that they enter the small firm covered sector and unemployment. As workers pushed out of the large firm covered sector by higher minimum wages enter the small firm covered sector, they drive down average wages in that sector. Our estimates suggest that a 10% increase in legal minimum wages will increase employment by 4.3% and reduce wages by 1.9% in the small firm covered sector. We find no significant wage and employment effects on self-employed workers or on workers in the public sector suggesting that minimum wages are not affecting these workers indirectly either through public sector wage setting or shifts in the supply of labor.

5. Econometric Methodology and Findings

Our goal is to estimate the extent to which an increase in minimum wages increases/decreases the probability that a person in the labor force (with particular characteristics) will be poor or extremely poor. We begin by estimating the following equation with a probit model using individual-level data on members of the labor force (employed plus unemployed who worked before) using a pooled data set of all seven surveys from 2001 to 2004:[18]

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[18] The data in the regression are weighted by sample weights. Estimated standard errors are robust to heteroskedasticity and serial correlation as well as corrected for the clustering of errors around minimum wage categories at each survey date.

$$Poor_{it} = a_o + a_1 lnMW_{it} + \overline{X_{it}}\beta + \sum_{j=1}^{J} \lambda_j IND_{itj} + \sum_{t=1}^{T} \gamma_t YR_t + \mu_{it} \qquad (1)$$

where *Poor*, equals 1 if the worker is living in a poor (or extremely poor) family. The explanatory variable of interest is $lnMW_{it}$, the log of the real hourly minimum wage (in 1999 Lempiras) that applies to that firm size and industry at time t. The coefficient α_1 is an estimate of the effect of one percent increase in legal minimum wage on the probability an individual in the labor force is poor. The vector X_{it}, controls for other factors that explain low wages and poverty (education, age, age squared, family size, dummy variables for rural/urban location and gender). We include fixed effects for the month and date of the survey, YR_t, to control for changes in the survey design and any time-specific factors such as aggregate supply and aggregate demand changes or changes in the timing of the surveys. We also include 22 industry/firm-size dummies (IND_{it}) to control for industry/firm-size specific fixed effects and for the endogenous correlation of employment and minimum wages across industry categories.

Because we find that minimum wages are only complied with in large firms, we also estimate separate coefficients for the effects on individuals in large v. small firms (covered sector) as well as for individuals the two uncovered sectors – self-employed and public sector workers.

The coefficients on the minimum wage (α_1) presented in Table 4 indicate that a 10% increase in the minimum wage will lower the probability that a person in the labor force is extremely poor by 2% and may lower the probability that a person in the labor force is poor by 1%, although this second coefficient is not statistically significant at conventional levels. The findings in the next rows demonstrate clearly that the negative relationship between changes in minimum wages and poverty is being driven entirely by

the higher wages in the large firm sector as the coefficients on all other sectors are insignificant. Hence workers who are in the large firm sector gain from a minimum wage increase in terms of some leaving poverty. Workers in the small scale sector are not made worse off – in terms of poverty – by minimum wage hikes but, as we found in Gindling and Terrell (2006), their wages are lowered in this sector as it absorbs some as of workers that lose their jobs in the large firm sector.

We next ask to whether the findings in the first row of Table 4 hold more strongly for low paid workers than for high paid workers. Hence, in separate probit regressions we interact the minimum wage variable in equation (1) with a dummy variable for different characteristics of workers that signal low v. higher pay: i.e., unskilled (people with up to an elementary school education) v. skilled (with more than an elementary school education); heads v. non-heads of households; urban v. rural; male v. female; and younger (15 to 21 years of age) v. older (21+ years) individuals. The estimated coefficients from these interacted variables are shown in Table 5; they indicate that in almost all cases, the relationship between increases in the minimum wage and poverty reduction is stronger among the lower paid workers (unskilled, rural, female and young) than among their higher paid counterparts. For example a 10 % increase in the minimum wage reduces the probability that a woman is extremely poor by 3.3% and poor by 2.3% whereas the point estimates for men are much smaller and not statistically significant. This would lower the incidence of extreme poverty among women from 33.9% to 33.1% and their incidence of poverty from 21.4% to 20.7%. The one case where this does not hold is with heads and non-heads of households. The evidence presented in Table 5 suggests that hikes in the minimum wages lowers the probability that the head of a

18

household is poor by more than it lowers the probability that the non-head of a household is poor. This is important because the proportion of working household heads that are poor is a stronger indicator of the proportion of families who are poor. These results suggest that minimum wages in Honduras are correlated with a bigger reduction in families in poverty than the results for individual workers (from Table 4) would suggest.

In Table 6 we address the question of whether this minimum wage/poverty relationship, which we learned in Table 4, is being driven by changes in the large scale sector more than the small scale sector, continues to hold for workers with low pay more than for workers with higher pay in large v. small firms. The findings in Table 6 show that indeed, the coefficients for small firms are nearly all insignificant whereas for large firms they are nearly all significant. Within large firms, the estimates indicate that minimum wages have a larger impact on poverty among the unskilled relative to the skilled, the old relative to the young, and especially in the rural areas relative to the urban areas. Their impact on poverty reduction is not significantly different among heads v. non-heads of households and between men and women in the large firm sector.

7. **Conclusions**

We conclude from these findings that increases in the minimum had a modest poverty reducing effect in Honduras during 2001-2004: A 10% increase in the minimum wage is associated with a 1.8% fall in extreme poverty and a 1.0% decline in poverty among all individuals in the labor force. Checking this with the historical record, we note that minimum wages in Honduras rose by 10.9% over this period; and extreme poverty fell from 46.8% to 42.1%, which is more than 2% decline predicted by our model, indicating additional factors are at play in reducing poverty. The impact of minimum

wages on poverty reduction is driven by one sector where minimum wages are enforced -- i.e., the large firm sector -- where only 20% of the labor force is located. We find no indirect (significantly negative or positive) effects on the small firm sector (where minimum wages should apply but are not enforced) or the two uncovered sectors (self-employed and public sector). Closer inspection of the relative effects on lower paid v. higher paid workers indicates that the poverty reduction effects tend to be larger among the unskilled and especially the rural areas, which experience the largest poverty reduction impact. (A 10% increase in the minimum wage lowers extreme poverty by 4.4% and poverty by another 4.1% in rural areas). We find, contrary to findings by Sagat (2001) and Arango and Pachón (2006), that Honduras' minimum wage impacts extreme poverty as well as poverty in spite of a relatively high minimum wage (in terms of the poverty line or average wage).

We stress that these findings are reduced form estimates of the net impact of minimum wages on poverty. A more thorough analysis using panel data on individuals (which is not available in Honduras) would estimate a structural/dynamic model of the channels driving these net effects on poverty reduction.

We noted at the outset that questions are being raised with respect to the role of minimum wages in a fiercely competitive global economy. Some argue that they impede employment creation, especially of "good" jobs (Heckman and Pages, 2001; Pages and Micco, 2006) while others argue that minimum wages can shift the composition of employment toward "good jobs" (Acemoglu, 2001). We have shown in companion studies that minimum wage legislation can reduce the number of good jobs in the formal/regulated sectors and increase the number of jobs in the informal/unregulated

sector in Honduras (Gindling and Terrell, 2006) and Costa Rica (Gindling and Terrell, 2007). Moreover, increases in the minimum wages lower the wages of employees in the small firm sector in Honduras. However, we have shown in this paper that the impact of increased minimum wages on poverty in the small sector is not significant (although the coefficient is estimated with a positive sign). These combined findings imply that someone in the household of the individual working in the small firm sector had to increase his/her labor supply in response to the minimum wage increase in order to keep the family out of poverty. This can be interpreted as a reduction in the household's welfare if not an increase in its poverty. If the increased supply of labor is from a child that should be in school, then there are implications for long-term poverty among the next generation.

In an era of globalization, the extent to which countries are competitive is an important consideration. However, one would hope that governments could help protect their workers from fierce competition (the "race to the bottom") by creating an environment that enables good job creation and poverty reduction while at the same time not hampering and hopefully enhancing firms' competitiveness. This is a difficult challenge. In that context, however, there is the argument that raising minimum wages will force employers to consider investing in capital and other complementary factors that increase a worker's productivity when they might not have otherwise. Hence increased minimum wages may stimulate employers to seek ways to increase their efficiency and remain competitive in the global economy. This is an area that needs further study with data from developing countries.

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Table 1: Poverty Rates for Different types of Workers in Honduras (avg. for 2001-2004)

Area	Extremely Poor	Poor	Non-Poor	Share of Total
Covered Large	19.0	24.7	56.2	20.3%
Covered Small	46.4	19.9	33.7	36.3%
Self-employed	51.1	17.8	31.1	36.2%
Public	9.8	18.9	71.4	7.2%
Unskilled*	49.3	20.5	30.2	67.6%
Skilled**	14.5	21.1	64.4	32.4%
Non-Head	41.2	20.1	38.7	56.6%
Head	41.1	19.9	39.0	43.4%
Rural	62.0	9.9	28.1	48.3%
Urban	27.1	27.4	45.5	51.7%
Female	33.9	21.4	44.8	35.8%
Male	45.2	19.3	35.5	64.2%
Young (15-21)	50.4	19.5	30.0	24.4%
Older (21+)	38.2	20.2	41.6	75.6%
All Workers + Unemp.	44.0	18.9	37.1	100.0%

*Unskilled are individuals primary or less education.

**Skilled are individuals with some secondary or higher education.

Source: Authors calculations from the Honduran Household Surveys.

**Table 2: Percent of Workers who Earn
Within 10% of the Minimum Wage that
are Poor (average over 2001-2004)**

All Workers	71
Skilled	60
Unskilled	72
Household head	80
Non-head	64
urban	71
rural	70
male	75
female	63
old	73
young	64

Source: Authors calculations from the Honduran
Household Surveys.

Table 3: Share of Workers Earning Less than, At, and More than the Minimum Wage by Sector (Average for 1990-2004)

	Less Than[1]	At[2]	More Than[3]
Total	32.4%	9.3%	58.2%
Private Salaried Employees			
Large	16.9%	12.4%	70.7%
Small	39.8%	9.7%	50.4%
Self-Employed	43.2%	7.1%	49.7%
Public	6.0%	5.3%	88.7%

[1]Less than 90% of the Minimum Wage

[2]Within 10% of the Minimum Wage

[3]110% or more than the Minimum Wage

Source: Authors calculations from the Honduran Household Surveys.

Table 4: Impact of an Increase in the Minimum Wage on the Poor and the Extremely Poor: All Workers Plus Unemployed and by Large and Small Firms[1]

Sample	Poor	Extremely Poor
All Workes plus Unemployed	-0.103 *0.074*	-0.184** *0.084*
Covered Large	-0.191** *0.081*	-0.195*** *0.055*
Covered Small	0.454 *0.459*	0.158 *0.397*
Self-employed	0.292 *0.341*	0.495 *0.440*
Public	0.144 *0.238*	-0.024 *0.121*

[1]Cofficients on the log of the Minimum Wage estimated with the a probit as specified in Equation (1) in the text.

Notes: Standard errors, in italics, are robust to heteroskedasticity and serial correlation as well as corrected for the clustering of errors around minimum wage categories in each year.

*significant at the 0.10 confidence level
**significant at the 0.05 confidence level
***significant at the 0.01 confidence level

Table 5: Impact of an Increase in the Minimum Wage on the Poor and the Extremely Poor for Sub-Groups n the Labor Force[1]

Sample	Poor	Extremely Poor
Unskilled	-0.136	-0.222**
	0.086	*0.094*
Skilled	-0.078	-0.131
	0.083	*0.100*
Non-head	-0.087	-0.173**
	0.073	*0.083*
Head	-0.134*	-0.212***
	0.073	*0.082*
rural	-0.406***	-0.440***
	0.086	*0.087*
urban	0.058	-0.027
	0.073	*0.084*
female	-0.225**	-0.334***
	0.097	*0.109*
male	-0.031	-0.109
	0.077	*0.085*
young (15-21)	-0.161*	-0.231**
	0.093	*0.099*
older (21+)	-0.082	-0.170**
	0.073	*0.082*

[1]Cofficients on the log of the Minimum Wage estimated with the a probit as specified in Equation (1) in the text.

Notes: Standard errors, in italics, are robust to heteroskedasticity and serial correlation as well as corrected for the clustering of errors around minimum wage categories in each year.

*significant at the 0.10 confidence level
**significant at the 0.05 confidence level
***significant at the 0.01 confidence level

Table 6: Impact of an Increase in the Minimum Wage on the Poor and the Extremely Poo for Sub-Groups in the Labor Force in Small and Large Firms[1]

Sample	Large Firms		Small Firms	
	Poor	Extremely Poor	Poor	Extremely Poor
Unskilled	-0.373***	-0.279***	0.612	0.263
	0.104	*0.073*	*0.532*	*0.414*
Skilled	-0.009	-0.001	0.76	0.456
	0.120	*0.096*	*0.553*	*0.486*
Non-head	-0.134*	-0.170***	0.511	0.108
	0.078	*0.054*	*0.441*	*0.394*
Head	-0.219***	-0.205***	0.468	0.058
	0.076	*0.059*	*0.441*	*0.393*
rural	-0.512***	-0.381***	-0.068	-0.156
	0.134	*0.094*	*0.427*	*0.351*
urban	-0.015	-0.063	0.592	0.189
	0.072	*0.049*	*0.401*	*0.383*
female	-0.166	-.277**	1.054**	0.687
	0.114	*0.112*	*0.512*	*0.547*
male	-0.197**	-0.187***	0.319	-0.058
	0.084	*0.051*	*0.419*	*0.345*
young	-0.125	0.080	0.662	0.103
	0.149	*0.102*	*0.486*	*0.550*
old	-0.159**	-0.208***	0.47	0.098
	0.080	*0.056*	*0.435*	*0.414*

[1]Cofficients on the log of the Minimum Wage estimated with the a probit as specified in Equation (1) in the text.
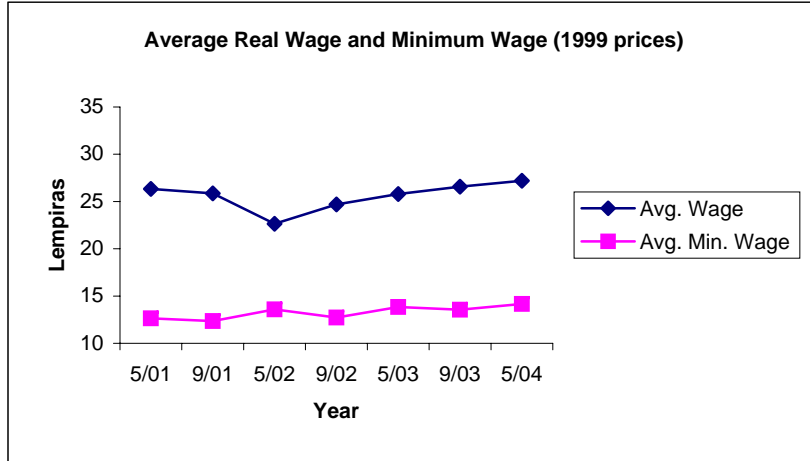
Notes: Standard errors, in italics, are robust to heteroskedasticity and serial correlation as well as corrected for the clustering of errors around minimum wage categories in each year.
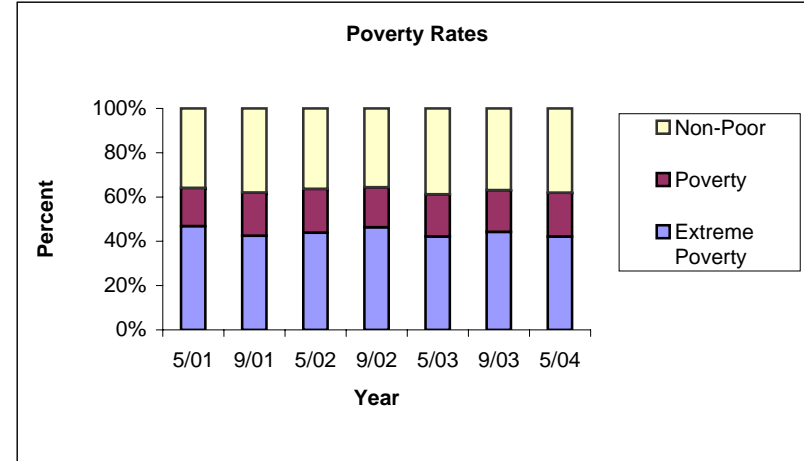*significant at the 0.10 confidence level
**significant at the 0.05 confidence level
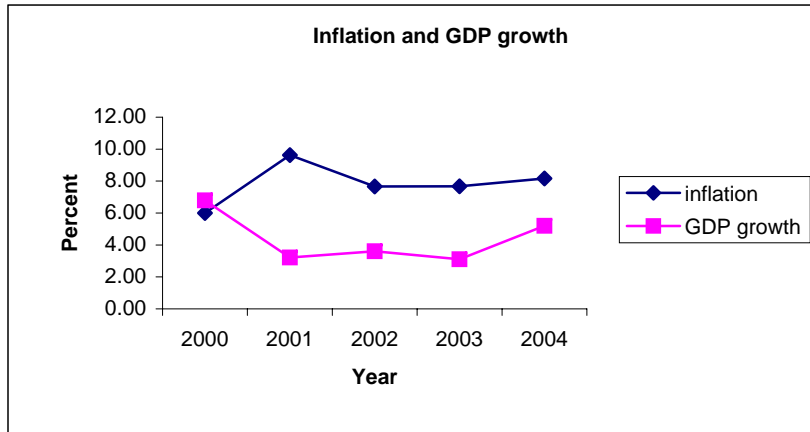***significant at the 0.01 confidence level
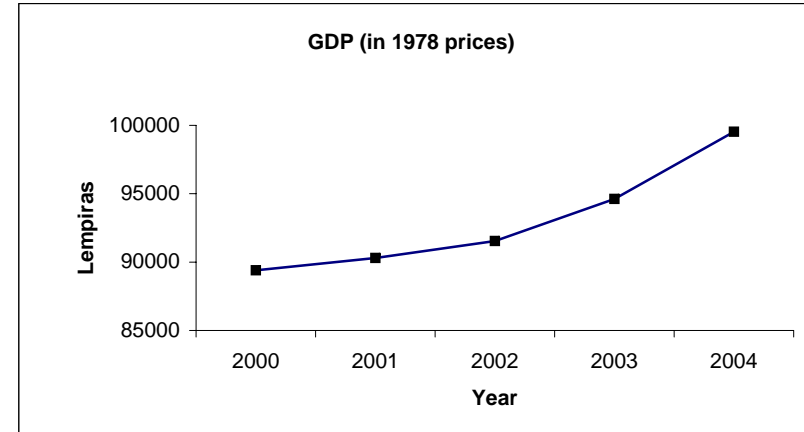
Figure 1: Macroeconomic Indicators for Honduras

Average Real Wage and Minimum Wage (1999 prices)

Source: Author's calculations from the Honduran Household Surveys

Poverty Rates

Source: Author's calculations from the Honduran Household Surveys

Inflation and GDP growth

Source: Central Bank of Honduras

GDP (in 1978 prices)

Source: Central Bank of Honduras

Figure 2: Kernel Density Distribution of the Log Wage Minus the Log Minimum Wage in Each Sector

Kernel Density Function--Log Wage minus Log Minimum Wage

Large Firm Covered Sector

Kernel Density Function--Log Wage minus Log Minimum Wage

Small Firm Covered Sector

Kernel Density Function--Log Wage minus Log Minimum Wage

Uncovered (self-employed) Sector
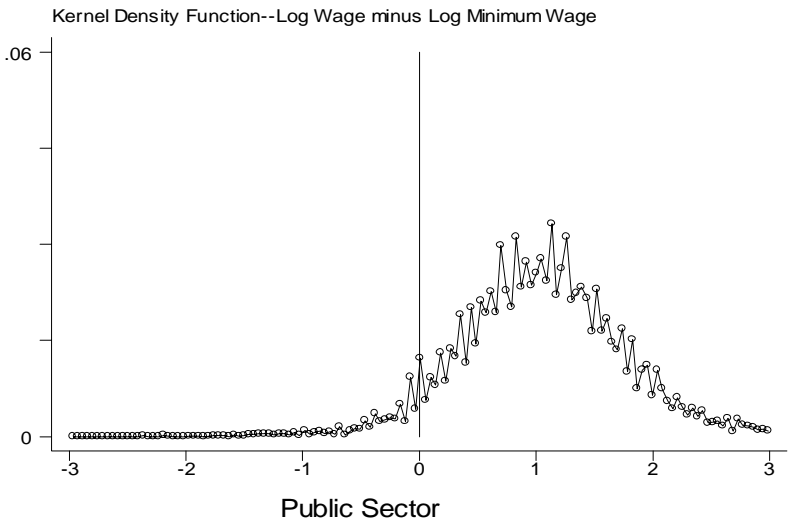
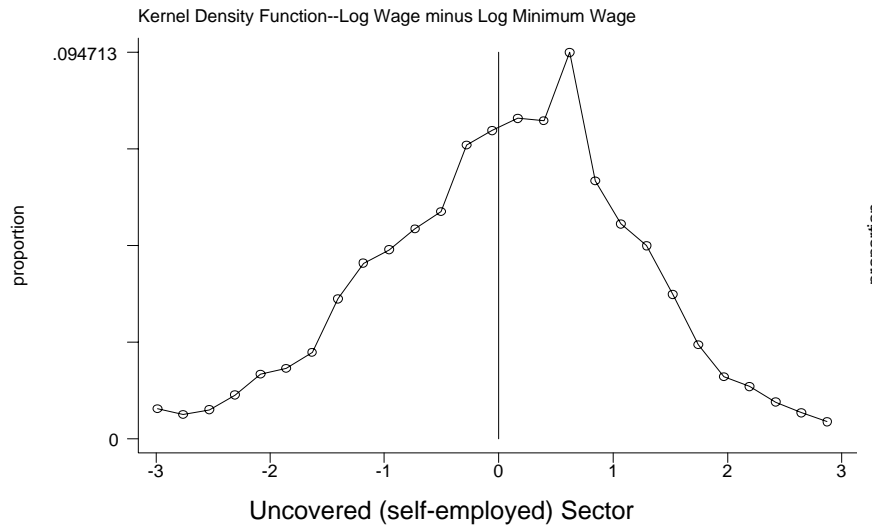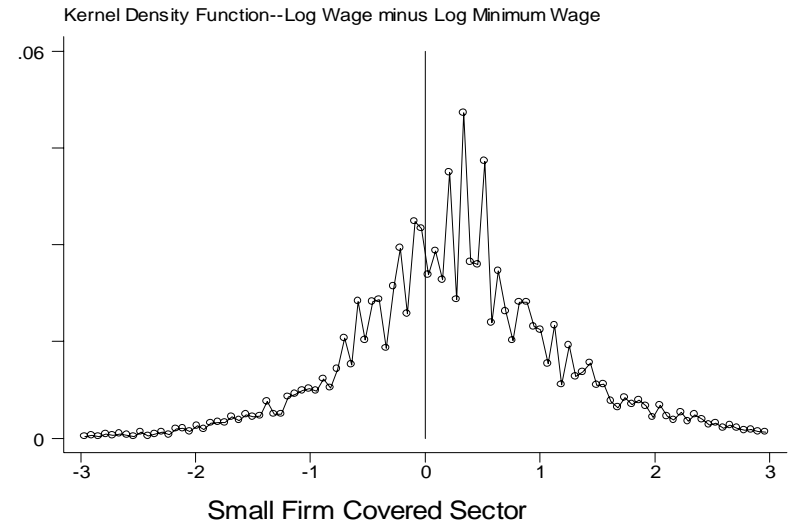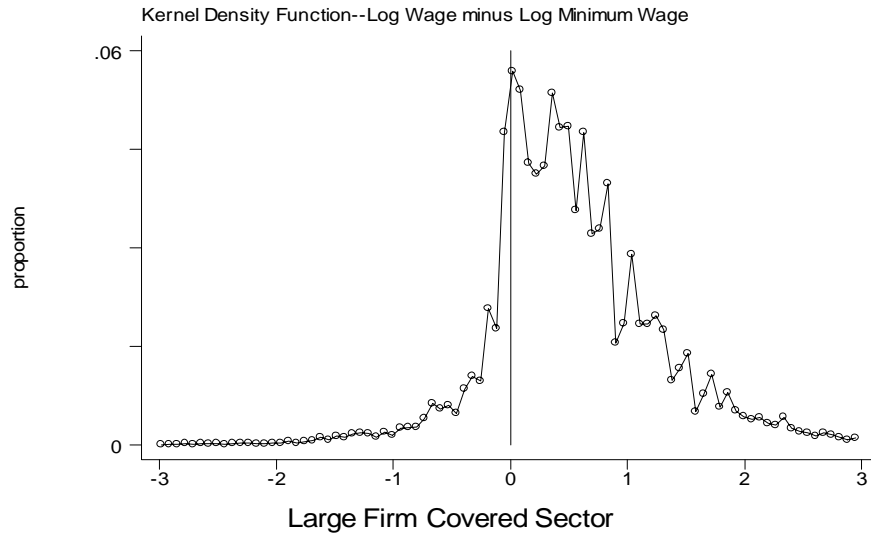Kernel Density Function--Log Wage minus Log Minimum Wage

Public Sector

Table A1: Real Daily Minimum Wage (Dec. 1999 Monthly Prices)

Sector	May_01	Sept_01	May_02	Sept_02	March_03	Sept_2003	May_2004
Agriculture, Hunting and Fishing							
1 -15 workers	34.60	33.73	35.25	32.83	36.82	35.85	37.91
16+ workers	48.62	47.39	49.47	46.08	50.30	48.97	50.45
Non-Metalic Mining	60.55	59.02	61.03	56.85	61.97	60.34	62.16
Metalic Mining							
1 -15 workers	36.33	35.41	38.72	36.07	40.44	44.06	41.65
16+ workers	50.35	49.07	52.71	49.10	53.46	56.74	53.64
Manufacturing							
1 -15 workers	36.33	35.41	38.72	36.07	40.44	39.37	41.65
16+ workers	50.35	49.07	52.71	49.10	53.46	52.05	53.64
Utilities	54.76	53.37	61.03	56.85	61.97	60.34	62.16
Construction							
1 -15 workers	36.33	35.41	38.72	36.07	40.44	39.37	41.65
16+ workers	50.35	49.07	52.71	49.10	53.46	52.05	53.64
Trade, Hotels and Restaurants							
1 -15 workers	36.33	35.41	38.72	36.07	40.44	39.37	41.65
16+ workers	50.35	49.07	52.71	49.10	53.46	52.05	53.64
Transptn., Storage and Comm.							
1 -15 workers	41.09	40.05	44.06	41.04	46.54	45.31	47.40
16+ workers	52.08	50.76	51.09	47.59	51.88	50.51	52.04
Financial Services							
1 -15 workers	54.76	53.37	61.03	56.85	61.97	60.34	62.16
16+ workers	60.55	59.02	61.03	56.85	61.97	60.34	62.16
Real Estate							
1 -15 workers	41.09	40.05	44.06	41.04	46.01	45.31	47.40
16+ workers	52.08	50.76	51.09	47.59	51.88	50.51	52.04
Business Services							
1 -15 workers	41.09	40.05	44.06	41.04	41.04	39.96	37.77
16+ workers	52.08	50.76	51.09	47.59	47.59	46.33	43.80
Communal Services							
1 -15 workers	36.33	35.41	38.72	36.07	40.44	39.37	41.65
16+ workers	50.35	49.07	52.71	49.10	53.46	52.05	53.64