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Measuring the Impact of Minimum Wages
Evidence from Latin America

William F. Maloney and Jairo Nuñez Mendez

Minimum wages have again surfaced as a central issue in labor market policy in the region. In countries such as Mexico and Brazil, the real level of the minimum wage became so eroded over the 1980s that there is pressure to provide a "living" income for those at the lower tail of the distribution. On the other hand, high rates of unemployment in some countries and the premium that more open trade postures put on labor market flexibility has made policy makers wary of introducing new rigidities.

This chapter first provides an overview of the levels of minimum wages in Latin America and their true impact on the distribution of wages using both numerical measures and kernel density plots for eight countries (Argentina, Bolivia, Brazil, Chile, Colombia, Honduras, Mexico, and Uruguay). In particular, it attempts to identify effects higher in the wage distribution and in the unregulated or "informal" sector. The central message is that the minimum wage has impacts on wage setting far beyond those usually contemplated and likely beyond those found in the industrialized countries. The final section then employs panel employment data from Colombia, a country where minimum wages seem high and very binding, to quantify these effects and their impact on employment.

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Individual country kernel density analysis was done by Wendy Cunningham (Argentina, Mexico), Norbert Fiess (Brazil), Claudio Montenegro and Claudia Sepulveda (Chile), Edmundo Murrugarra (Uruguay), Mauricio Santamaria (Colombia), and Corinne Siaens (Bolivia, Honduras), and we are exceptionally grateful for their efforts. Our thanks for helpful comments to James Heckman, Carmen Pagés, and Guillermo Perry. This work was partially financed by the Regional Studies Program of the office of the chief economist, Latin America and Caribbean region, the World Bank.

1.1 The Importance of the Minimum Wage

The redistributional effects of the minimum wage may have the potential to reduce poverty and even foster growth (see Freeman and Freeman [1992] for a summary of the U.S. debate), but the larger concern in the literature is that the secondary effects through the creation of new rigidities in the labor market and the potential decrease in employment opportunities may offset these gains. The simplest textbook models suggest that putting a wage floor above the equilibrium level will lead to a fall in employment. These effects have traditionally appeared to be weak in the United States, perhaps with the exception of young workers (see, for example, Brown, Gilroy, and Kohen 1982; Card, Katz, and Krueger 1993). Dickens, Machin, and Manning (1999) argue that their finding from the United Kingdom of important impacts on wages, but none on employment, is consistent with the fact that employers generally have some monopsony power in contrast to the usual textbook competitive model.

However, other work does find important adverse effects on employment. Currie and Fallick (1996), Abowd, Kramarz, and Margolis (1999), Neumark, Schweitzer, and Wascher (2000), and Neumark and Wascher (1992) report sharp disemployment effects for those constrained by the minimum wage, with employment elasticities of between 0.4 to 1.6 (in absolute value).[1] Comparing the United States to France, Abowd, Kramarz, and Margoliz (1999) find strong negative impacts on employment in the latter on those workers who earn around the minimum wage. Using a pooled cross-section-time series panel from the Organization for Economic Cooperation and Development (OECD), Neumark and Wascher (1999) find evidence of employment losses for youth, although the magnitude of the impact diminishes where subminimum wages exist for youth and where employers have some discretion in adjusting nonpecuniary characteristics of jobs.

The evidence from Latin America overall suggests large effects. Freeman and Freeman's (1991) analysis of the imposition of U.S. minimum wage norms on Puerto Rico in 1977 leads them to argue that the weak U.S. evidence results primarily from the fact that the minimum wage is so low as to "nibble" rather than "bite" at the wage distribution. When the minimum in Puerto Rico was raised to 63 percent of the average manufacturing wage, the elasticity of employment to the minimum wage became 0.91, and raising the wage led to massive job loss on the island. Card and Krueger (1995),

1. They argue that the Card, Katz, and Krueger (1993) findings of no impact results from misspecification both in the omission of a school enrollment effect and lagged dependent variable and incorrect estimation approach that, when corrected, removes the inconsistency in their findings. Card, Katz, and Krueger (1993) take issue with the latter set of findings on several counts, although in addressing these issues Neumark and Wascher (1993) find their original conclusions strengthened.

however, argue that these results are not robust and, in fact, once they correct for the overweighting of very small firms they find that employment *increased* (Card and Krueger 1995, 272). Nonetheless, the presence of adverse employment effects appears to be supported by Bell (1997) in her study using manufacturing panel data from Mexico and Colombia. She finds no impact of the minimum wage in Mexico, where it was not binding. However, in Colombia, she finds an employment elasticity of unskilled workers on the order of 0.15–0.33 and for skilled workers 0.03–0.24, with the effect on workers paid near the minimum wage between 0.55 to 1.22. She concludes that, across the period 1981–1987, the 10 percent rise in the minimum wage from 1981–1987 reduced low-skilled, low-wage Colombia employment in the range of 2 percent–12 percent.

The potentially very high elasticities of those earning near the minimum wage makes the overall impact on poverty potentially ambiguous; an elasticity over 1 implies that total income transfers to the target group *fall* with a rise in the wage. In the United States, the evidence is ambiguous. As examples, Card and Krueger (1995) find weakly significant improvements in poverty, whereas Neumark, Schweitzer, and Wascher (2000) find that earned incomes of low-wage workers decline in response to minimum wage increases, and poverty actually increases.[2] The debate arguably becomes more relevant in less developed countries (LDCs) where enforcement of labor norms is thought not to extend to the "informal" sector. This group of workers is generally found in the unregulated microfirm (usually under five employees) sector, where neither employers nor employees are registered with social protection institutions or authorities more generally. Standard dualistic models ranging from the earliest (Harris and Todaro 1970) to some of the most recent (Agenor and Aizenman 1999) see these unprotected workers as the disadvantaged sector of a labor market segmented by nominal wage rigidities such as the minimum wage. Here, the worker who loses his job has no access to unemployment insurance and instead takes refuge in the informal sector where the wage adjusts to accommodate supply. In this case, a rise in the minimum wage forces some workers into jobs where they earn below what they did before. The available empirical evidence for Latin America is ambiguous. Morely (1995) and de Janvry and Sadoulet (1996) find that poverty falls with a rise in the minimum wage, but only for periods of recovery in the former study and only in periods of recession in the latter. Using worldwide LDC data, Lustig and McLeod (1997) confirm a negative effect on employment and poverty.

The minimum wage also enters strongly into debates about the impacts of mandated nonwage benefit payments and other regulations on labor demand. If, for instance, the worker fully values the health insurance pro-

2. Their evidence suggests that the pressure for implementing minimum wages comes from unions seeking to reduce wage competition.

vided by the employer, then, in a market with no rigidities, his or her wage will fall by an equivalent amount. However, in the presence of a wage floor, the mandated benefit raises total costs to the worker and hence reduces total demand. In reality, most regulation can be imagined as a tax on firms whose incidence depends partly on how much workers value it and partly on rigidities in the nominal wage. As an example, restrictions on firing implicitly deprive the firm of an "option" to divest itself of an asset (the worker) and therefore a tax equal to the option value. This could be passed down to the worker as the cost of job security if the worker is risk averse, but not if the minimum wage is binding. The adverse employment effects of poorly designed labor market policies thus can become more extreme in the presence of minimum wages.

A final consideration is how minimum wages may affect how economies adjust to shocks, whether through employment or wages. In the 1994–1995 Tequila crisis, Mexico allowed real wages to be eroded over 25 percent and saw only moderate increases in unemployment. The Colombian Constitution, on the contrary, insists on a *salario minimo movil,* which has been interpreted dictating indexation to past inflation, and this has arguably contributed to the high rates of unemployment experienced in response to the financial crisis of 1998.

1.2 Numerical Measures of the Incidence of Minimum Wages

Raw comparisons of the real minimum wage across countries are of limited use. From both the perspective of improving equity and minimizing labor market distortions, what is of interest is the level of the minimum wage relative to the distribution of remuneration in the individual country. To argue that the minimum is "too low" in Brazil because it is a fraction of that in Argentina is irrelevant if overall labor productivity differs by similar magnitudes.

As a first cut at international comparison, figure 1.1 ranks various Latin American and OECD countries by the minimum wage standardized by the mean wage (SMW).[3] Latin America spans the range with Uruguay, Bolivia, Brazil, Argentina, Chile, and Mexico having the lowest values, and Venezuela, El Salvador, Paraguay, and Honduras having among the highest.[4]

3. The source for countries discussed in detail here are International Bank for Reconstruction and Development (IBRD) staff estimates for the most recent years available. All others come from Inter-American Development Bank (IADB) (1999).

4. The analysis uses the Permanent Household Survey (EPH) from Argentina, the Continuous Household Survey (ECH) from Bolivia, the National Survey from the Sample of Households (PNAD) from Brazil, the Encuesta de Caracterización Socioeconómica Nacional (CASEN) from Chile, the Multipurpose Permanent Survey (EPHM) for Honduras, and the National Urban Employment Survey (ENEU) from Mexico. We restrict the sample to those sixteen–sixty-five, working between thirty and fifty hours a week for informal salaried workers (those working for firms of five employees or below) and formal salaried workers (six workers and above).

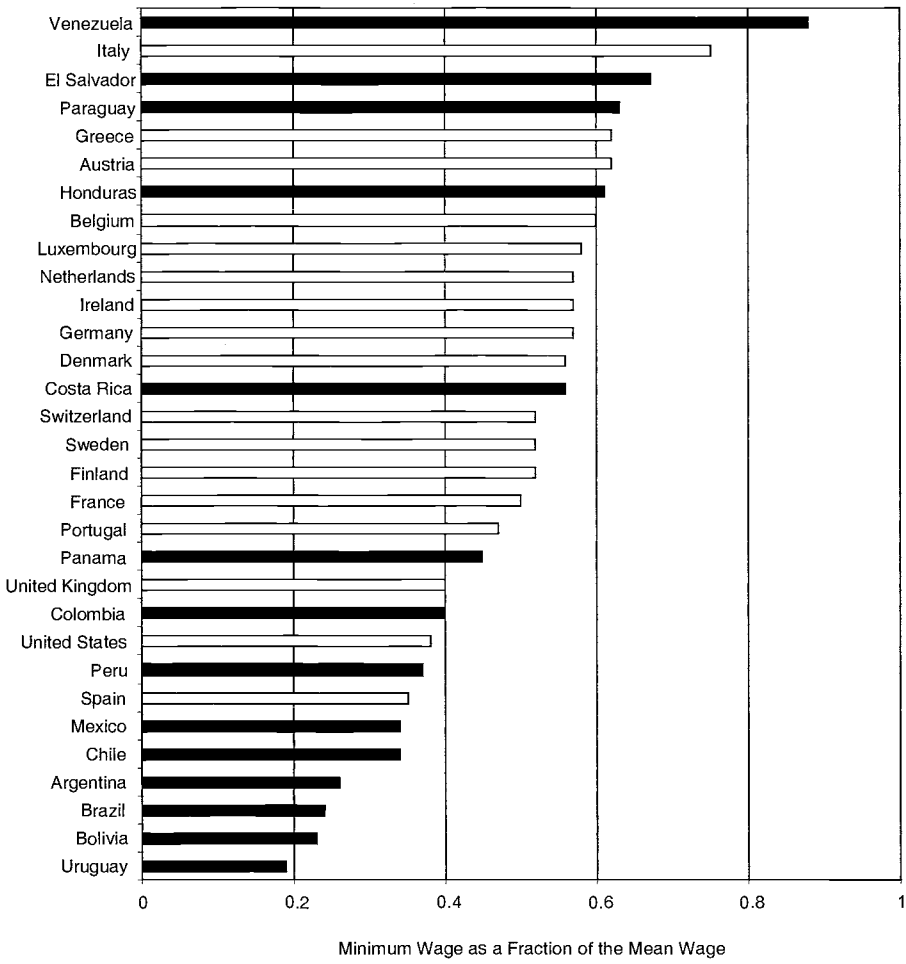


Fig. 1.1 Minimum wage/mean wage in OECD countries and in Latin America

Although informative, standardizing by the first moment is not sufficient to tell us whether the minimum wage is binding for two reasons. First, the number of workers affected will depend on the higher moments of the distribution as well; more disperse endowments of human capital (variance) or a particularly large fraction of poorly endowed workers (skewness) would lead to more workers being affected by a given SMW. Second, if the minimum wage is not enforced, very high SMWs are irrelevant.

As a second cut, table 1.1 offers several additional measures that attempt to provide a more rounded view. The first column presents the SMW, and the second standardizes by the wage at the 50th quantile (median). The median is a better measure of the central tendency because it is less sensitive to extreme values in the upper tail and to compression of the lower tail by

Table 1.1 Summary Statistics on Minimum Wages and Wage Distributions

		Minimum Wage				
Country	Date	Mean	50th	10th	Standard Deviation	Skewness
Argentina[a]	1998	0.26	0.33	0.67	0.67	0.53
Bolivia	1997	0.22	0.34	0.80	0.80	0.51
Brazil	1998	0.24	0.43	1.00	0.86	0.61
Brazil[a]	1998	0.22	0.37	1.00	0.71	0.60
Chile	1996	0.34	0.55	1.09	0.77	0.58
Colombia[a]	1998	0.40	0.68	1.00	0.51	1.16
Honduras	1999	0.62	0.90	2.26	0.80	–0.14
Mexico[a]	1999	0.34	0.48	0.87	0.64	0.83
Uruguay[a]	1998	0.19	0.27	0.64	0.72	0.06

Source: Authors' estimates.

Note: Samples include workers between sixteen–sixty-five years of age working thirty–fifty hours as salaried workers.

[a]Urban areas only.

the minimum wage. Using it to standardize reverses the SMW rankings of Argentina and Brazil. This effect is even more dramatic if we standardize by the wage at the 10th quantile of the distribution, arguably the range that is of more concern than the center.[5] Brazil suddenly appears among the countries with the most potentially binding minimum wage (excluding Honduras), and far above Argentina and Uruguay. This makes sense when it is noted that Brazil shows the highest wage variance among countries overall and among countries for which the sample is purely urban.

1.3 Graphical Analysis–Kernel Density Plots

However revealing theoretically, the 10th quantile, variance and skewness measures are problematic because they describe the distribution *after* the imposition of the minimum wage. A graphic approach, however, can reliably reveal how the distribution is distorted. The first panels of figure 1.2 are kernel estimates of the density function, with a vertical line to mark the location of the minimum wage.[6] Kernel density estimators approximate the density $f(x)$ from observations on x. The estimator calculates the density at the center of the weighted xs found within a rolling interval or "window." They differ from histogram both in allowing the windows to overlap and by the possibility of different weighting schemes on the xs.

5. Ten percent of the sample earns below this wage, and ninety percent earns above this wage.

6. See DiNardo, Fortin, and Lemieux (1996) for a thorough treatment of kernel density estimation and Velez and Santamaria (1999) for an application of the cumulative distribution function (CDF) to Colombia.

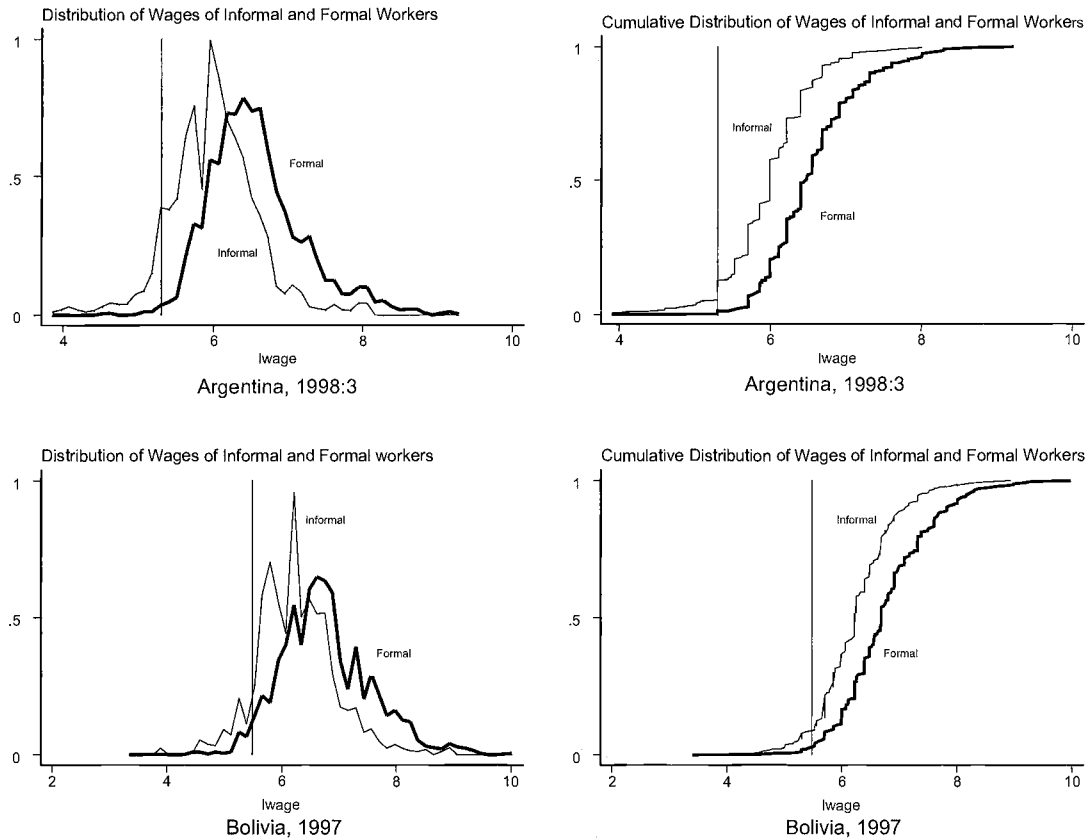
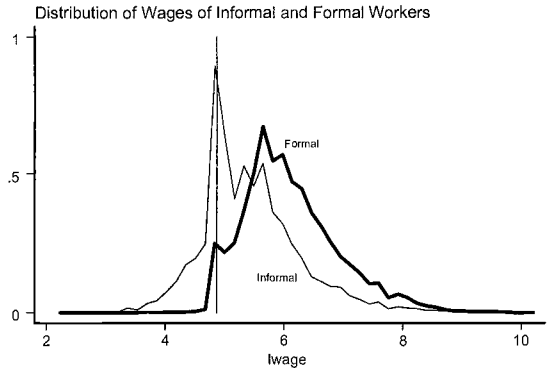


Fig. 1.2 Kernel density plots, cumulative distributions, and minimum wage


Distribution of Wages of Informal and Formal Workers
1
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0
Formal
Informal
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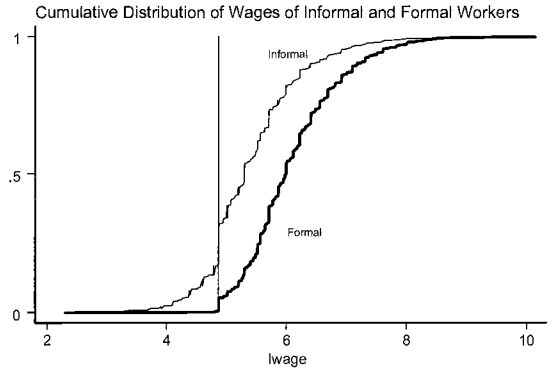
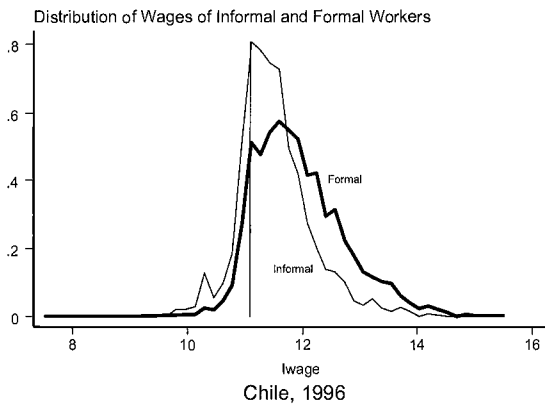
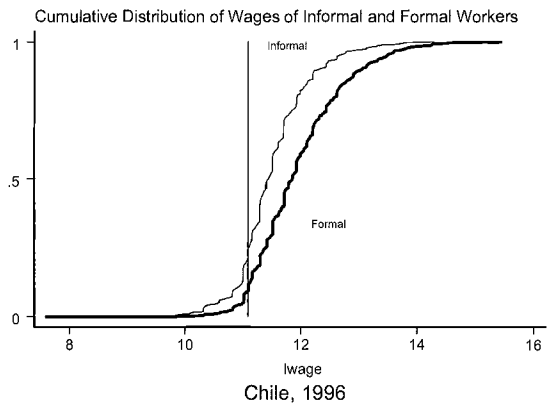
4
6
8
10
lwage
Brazil, 1998


Cumulative Distribution of Wages of Informal and Formal Workers
1
.5
0
Informal
Formal
2
4
6
8
10
lwage
Brazil, 1998


Distribution of Wages of Informal and Formal Workers
.8
.6
.4
.2
0
Formal
Informal
8
10
12
14
16
lwage
Chile, 1996


Cumulative Distribution of Wages of Informal and Formal Workers
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Informal
Formal
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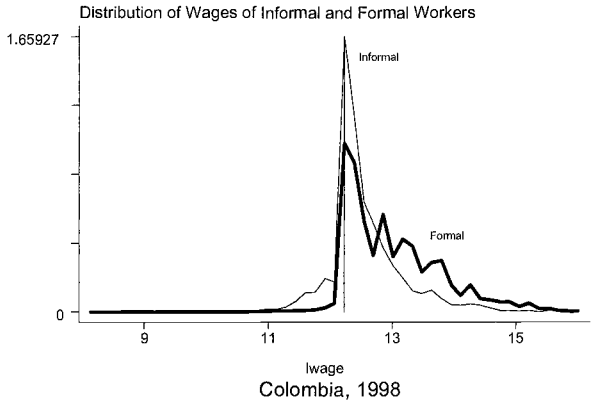
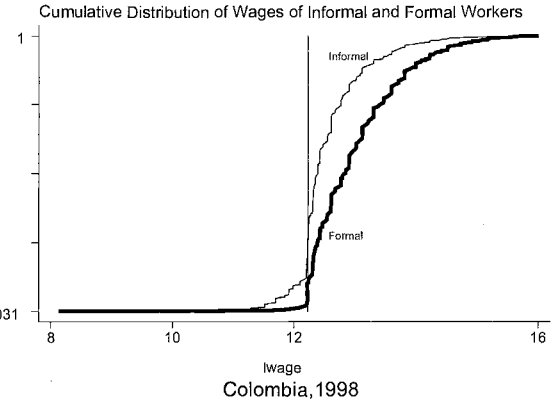
lwage
Chile, 1996

Fig. 1.2 (cont.)


Distribution of Wages of Informal and Formal Workers
1.65927
0
Informal
Formal
9
11
13
15
lwage
Colombia, 1998


Cumulative Distribution of Wages of Informal and Formal Workers
1
.000031
Informal
Formal
8
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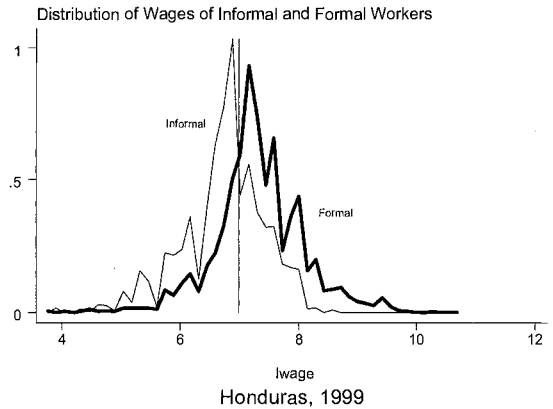
12
16
lwage
Colombia, 1998


Distribution of Wages of Informal and Formal Workers
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Informal
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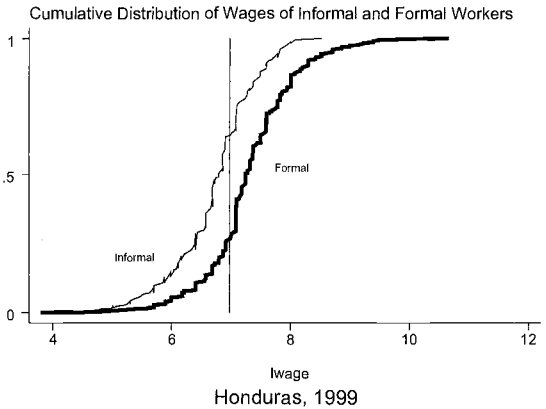
lwage
Honduras, 1999


Cumulative Distribution of Wages of Informal and Formal Workers
1
.5
0
Formal
Informal
4
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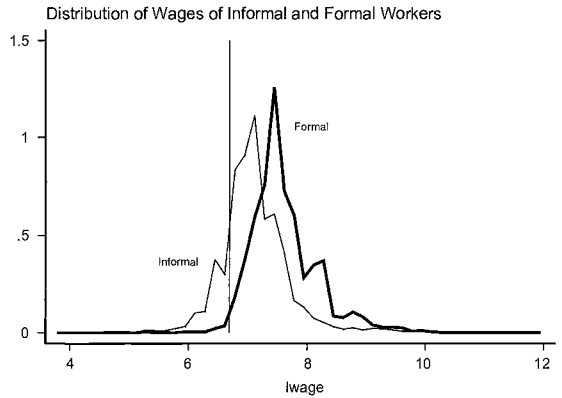
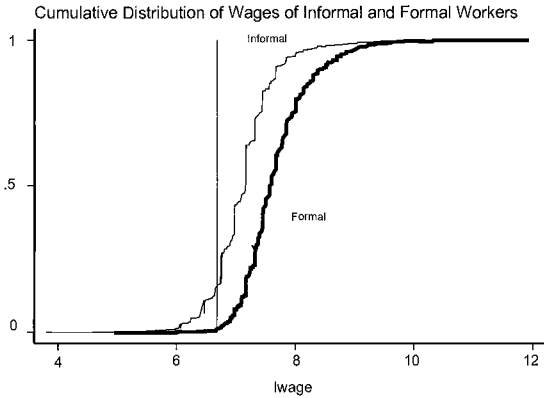
lwage
Honduras, 1999

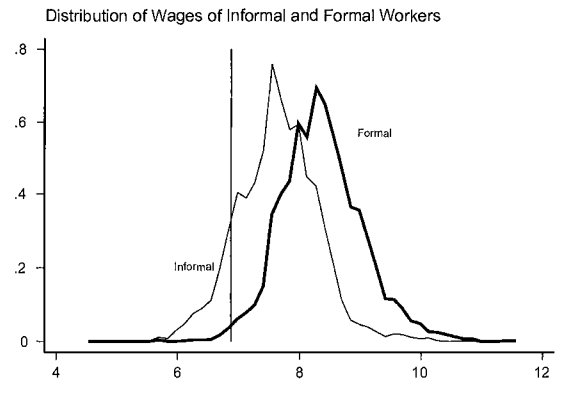
Fig. 1.2 (cont.)



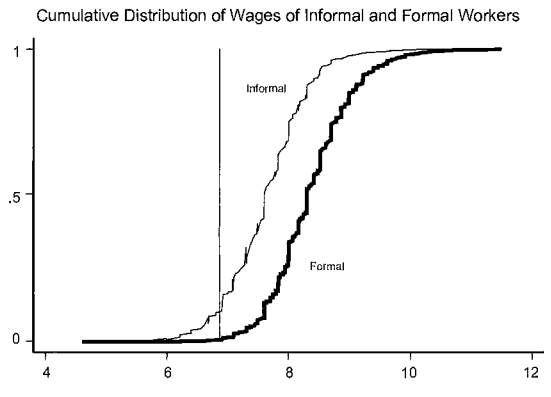
Mexico, 1999:1



Mexico, 1999:1



Uruguay, 1998



Uruguay, 1998

Fig. 1.2 (cont.)

$$\hat{f}_k = \frac{1}{nh} \sum_{i=1}^{n} K\left(\frac{x - X_i}{h}\right) \tag{1}$$

The function K determines the weights and is termed the "kernel." This estimator has the advantage of giving a clearer idea of the shape of the distribution, but it is sensitive to the bandwidth chosen to smooth. This is particularly important for detecting the impact of minimum wages because an excessively large bandwidth will smooth exactly the "cliff" where the minimum wage is binding. Some adjustments away from the default were necessary to present the most revealing plot.

The second panels are the cumulative distributions of wages. These require no judgements about bandwidths and the vertical "cliffs" indicate where the minimum wage, or multiples, may be influencing. Both the informal and formal wage distributions are plotted in light and dark lines, respectively.[7] In each graph, a "piling up" of the probability mass around the minimum wage, represented in all figures by a vertical line, suggests that the policy has, in effect, forced a change in the distribution.

1.3.1 Interpretation

What is immediately clear is that minimum wages do have the capacity to alter strongly the distribution of wages. Colombia provides an extreme example; the dramatic cliffs in the plots occurring around the minimum wage line, the low standard deviation, and the high skewness (table 1.1) likely reflect the impact of the minimum wage rather than the underlying distribution of human capital, confirming the more detailed findings of Santamaria (1998). Somewhat in contrast to common wisdom, of the Mercosur countries, Brazil and Chile appear to have more binding minimum wages in the formal sector than either the allegedly very rigid Argentina, or Uruguay.

More generally, enforcement varies widely across the region, and SMWs appear to be somewhat deceptive measures of the efficacy of the minimum wage to affect distribution or measures of labor market distortion. Chile and Colombia have SMWs far below that of Honduras, yet the distortion of the wage distributions in the first two seems dramatic in comparison. This suggests that a country's location in the range of SMWs (figure 1.1) is insufficient to indicate the impact of a rise in minimum wage and that empirical work with only the statutory measures may give a misleading picture of what is going on.

7. The informal sector is defined in each country either by whether a salaried worker is unaffiliated with social security systems, or works in very small firms (around six workers or less). The Colombian survey, in particular, has only limited data and therefore shows little difference in means between the two.

1.3.2 The Impact on the Informal Sector

In virtually all countries, there is evidence of what has been termed in Brazil the *Efeito Farol* or *lighthouse effect* on the informal distribution.[8] That is, the formal sector minimum wage serves as a reference throughout the economy, including sectors not legally bound by it. In fact, *the influence seems far stronger on the informal sector than the formal* in Brazil, Mexico, Argentina, and Uruguay, countries where the wage appears largely irrelevant to the formal distribution. In each of these cases, the lighter shaded informal wage distribution to the left of the formal sector distribution shows greater distortions around the minimum than is the case in the formal sector. It may be argued that the minimum wage is simply a signal of the wage level in high inflation countries, but the evidence is not supportive: Brazil, Colombia, and Mexico have very moderate rates of inflation in the sample period. Though probably not enforced by law, the minimum wage appears to be an important benchmark for "fair" remuneration.

This would seem to turn conventional conceptions of the relationship between the informal and formal sectors on their heads—the binding wage floor is now in the informal sector—and raises new questions about the *razon de ser* of the informal sector. If it is an inferior unprotected sector, why do workers receive some benefits and not others? Why does some concept of fairness dictate that informal workers should get the minimum wage, but not benefits? One possibility is that forwarded by Maloney (1998) that the sector is as much a way of avoiding the inefficiencies of labor market regulation as the regulations themselves. As discussed earlier, where there is no wage floor in the formal sector, the costs of benefits to employers may be largely passed down to workers in the form of lower wages. If this implicit tax is higher than the perceived benefits, then there is an incentive to evade and seek informal employment. Given that informal workers are, on average, substantially younger than formal workers, it may be that many are still covered by their fathers' health insurance or are recurring to less formal forms of social protection and hence would resist paying the implicit tax again. Further, the often gross inefficiencies in benefits provision drive another wedge between benefits and implicit taxes.

This finding also suggests that the standard dualistic model that sees the flexible informal sector wage as permitting the absorption of workers rationed out from the rigid formal sector is seriously incomplete. It is not clear why we shouldn't also expect a downward sloping demand curve in the informal sector and hence that the binding minimum wage leads to job loss there and reduced capacity to absorb the unemployed. Again, the pres-

8. The original reference of the *Teoria do Farol* is found with reference to Brazil in Souza and Baltar (1979). For more recent references, see Neri, Gonzaga, and Camargo (2000) as well as Amadeo, Gill, and Neri (2000). For recent work on minimum wages in Brazil, see Lemos (2003) and Neumark, Cunningham, and Siga (2003).

ent Colombian situation comes to mind.[9] The historically unprecedented unemployment rates may partially arise from the shock to formal production due to the collapse of the financial sector, but also the jobs lost in the informal sector with the sharp rise in the minimum wage over the last several years.

1.3.3 The Minimum Wage as a Reference for Other Formal Wages

Throughout the region it is common to use the minimum wage as a more general unit of account or *numeraire,* for instance, in quoting wages or monetary contracts in general. In Brazil, for example, Neri, Gonzaga, and Camargo (2000) find strong evidence of this effect throughout the wage distribution, finding that 9 percent of formal sector workers received exactly one minimum wage, but another 6 percent received exactly a multiple. Argentina, Brazil, Mexico, and Uruguay appear to show regular "cliffs" across the distribution that are synchronized between both the formal and informal sectors. The next section will test more explicitly for these effects.

1.4 Econometric Evidence on the Impact of the Minimum Wage from Colombia

In this section, we follow Neumark, Schweitzer, and Wascher (2000) in employing rotating panel data from Colombia to test the impact of a rise in the minimum wage on wages and the probability of becoming unemployed, and for *numeraire* effects in both. The existence of the panel, as well as the impression from the previous section that the minimum wage is high and binding made Colombia an obvious case study.

Since 1997, the National Statistical Agency (DANE) has created a rotating panel by reinterviewing 25 percent of households interviewed in the previous round of the National Household Survey (ENH), yielding a set of two consecutive quarterly observations on the same households. Individuals were identified by household and then on the basis of gender, age, marital status, relation with the head of household, schooling level, and years of education, variables which do not change between quarters. The Euclidian distance from each individual, with respect to the rest of the inhabitants of a house, is calculated and the match accepted if the distance is below a predetermined threshold. Roughly 15 percent of the individuals in a survey can be linked to the past one in eleven rotating surveys. As

9. Fiess, Fugazza, and Maloney (1999), for example, find that the Mexican and, to a lesser degree, the informal and formal sectors behave across the business cycle as if they were integrated sectors-earnings relative to the formal sector rise with share of the workforce in informality. In Colombia, on the other hand, the traditional dualistic view seems more supported with informal self-employment serving as a last resort and unemployment dramatically rising. See also Maloney (2003a,b) and Cunningham and Maloney (2001) for further discussions of the desirability of the informal sector.

Table 1.2 Colombia: Distribution of Sample by Salary Range

Salary in terms of Minimum Wage	Employed in $t = 1$		Unemployed in $t = 1$	
	Workers	Percentage	Workers	Percentage
0.0–0.5	559	6.24	267	15.99
0.5–0.7	574	6.40	229	13.71
0.7–0.9	1,112	12.41	237	14.19
0.9–1.1	1,444	16.11	235	14.07
1.1–1.3	1,095	12.22	145	8.68
1.3–1.5	536	5.98	85	5.09
1.5–2.0	965	10.77	132	7.90
2.0–3.0	1,121	12.51	155	9.28
3.0–4.0	455	5.08	49	2.93
>4.0	1,102	12.29	136	8.14
Total	8,963	100	1,670	100

Note: Sample includes men who work thirty–fifty hours per week.

table 1.2 shows, when we restrict to that used in the kernel density plots—men working thirty–fifty hours per week—we have a total of 10,633 observations who are employed in the first period. Slightly over 19 percent of these will become unemployed in the second period. Of these, 66 percent report being salaried workers, and 34 percent report being self-employed. Although the year chosen to estimate the kernel density plots permitted separating "formal" from "informal" wage earners in every period, this is not the case in other years, and we combine the two in the "salaried" sector. Roughly 25 percent earn below the minimum wage. However, the vast majority of these, as suggested in the kernel density plots, are informal.

We examine the self-employed as a control that can help separate general price indexing effects from "true" minimum wage effects. If the minimum is simply an economywide mechanism for coordinating prices, we might see the self-employed using it to fix their product prices. If this were not the case, we would expect that their incomes would be determined by the profitability of their enterprise, and they would not raise their implicit "wage" at the risk of becoming uncompetitive.

The panel nature of the data permits identifying the impact of the two annual changes in the minimum wage that occurred between 1997 and the end of the available sample in 1999.[10] We estimate the determinants of the percentage change in the real hourly wage worker i receives, (dw) or the probability of becoming unemployed (prob[$z = 1$]) across two quarters as

10. This period corresponds to what is widely acknowledged as the country's worst employment crisis in the postwar period.

$$(2)\quad \text{dw, prob}(z=1) = \sum_j \beta_j \mathbf{R}(w_{i1}, \text{mw}_1)_j \left(\frac{\text{mw}_2 - \text{mw}_1}{\text{mw}_1}\right) + \sum_j \gamma_j \mathbf{R}(w_{i1}, \text{mw}_1)_j + \sum_j \phi_j \mathbf{R}(w_{i1}, \text{mw}_1)_j \left(\frac{w_{i1}}{\text{mw}_1}\right) + \delta \mathbf{X}_{i1} + \lambda \text{T}_i + \pi \text{A}_i + \varepsilon_i,$$

where mw is the real minimum wage, respectively, in the two periods.[11]

Though it is common to examine the impact of the minimum wage on wages and employment at the minimum wage, the kernel density plots suggest that there are *numeraire* effects throughout the distribution. If we are interested in the total effect of the minimum wage on distribution and employment, we need to look for these effects as well. Further, there may be general equilibrium effects at higher wage levels through changes in relative demand. For these reasons, we create *j* dummy variables, the vector **R**, that locate individual *i*'s wage in the real hourly wage distribution in year 1 at fractions and multiples of the minimum wage (table 1.2). This allows us to see the impact of a change of minimum wage, not only on those earning one minimum wage, but also those earning, for example, two or three times the minimum wage.

The first term on the right-hand-side of the equation captures this effect of a change in the minimum wage on different regions of the wage distribution. The second term permits the level of wage growth, independent of minimum wage effects, to change by each cohort in the wage distribution. The third term induces more flexibility in the function, allowing the estimation of the implicit spline specification without constraining the lines to join at the knot points.

Finally, **X** is a vector with the individual characteristics such as gender, age, education, and so on, T and A are a set of quarterly and regional dummy variables which capture the dependence of observations of the same period (including seasonal effects) and region, respectively.

Previous papers find that low-income families receive a short-run benefit when the minimum wage increases but are negatively affected over the longer term (Neumark, Schweitzer, and Wascher 2000). This is because short-run adjustments are made via prices and long-run adjustments via quantities; firms must follow the law at first, but then, if required, they fire workers. For this reason, the lagged minimum wage gain $(\text{mw}_1 - \text{mw}_0)/\text{mw}_0$ is also introduced. From the point of view of measuring these longer-run impacts, it would be preferable to have, as Neumark, Schweitzer, and Wascher (2000) do, a full year span rather than the two quarter panels the ENH offers. This limitation may not be as serious as appears at first for measuring the impact on wages because the generally higher inflation rates in Latin America erode more quickly any mandated increase in the minimum wage than in the United States. It has also been argued by Brown,

11. The deflator used was the consumer price index for each city.

Table 1.3 **Colombia: Effect of a 1 Percent Rise in the Minimum Wage on Hourly Salaries**

Salary in terms of Minimum Wage	Self-Employed	Lag	Salaried	Lag
0.0–0.5	0.9860***	–0.0653***	1.7411***	–0.1191
0.5–0.7	1.0695**	0.0796	1.2325***	–0.1865**
0.7–0.9	1.1598	0.0486	0.8723***	–0.1576*
0.9–1.1	1.2723	0.0563	0.5971***	–0.1746*
1.1–1.3	0.4563	0.0583	0.6607***	–0.1618*
1.3–1.5	0.1591	0.0652	0.2861**	–0.1806*
1.5–2.0	0.7346	0.0597	0.3896***	–0.1794*
2.0–3.0	0.4508	0.0626	0.3528***	–0.1816*
3.0–4.0	0.1242	0.0680	0.3848**	–0.1654*
>4.0	0.0843	0.0703	0.1611***	–0.1736*
Average			0.6378***	–0.1696***
N	2,744		5,267	

Notes: Sample includes men who work thirty–fifty hours per week. *N* = number of observations.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

Gilroy, and Kohen (1982) that the high turnover in low-skilled workers may imply that employment adjustment in the most critical ranges around the minimum wage may be relatively rapid. Further, Maloney (2001) shows that average manufacturing tenure in Latin America is roughly 70 percent of the OECD, so the quantity adjustment might occur more rapidly. Nonetheless, we put less weight in our analysis on the lags and do not follow Neumark, Schweitzer, and Wascher (2000) in generating "representative" worker responses to lagged minimum wages.[12]

1.4.1 Effects on Wages

Table 1.3 reports the effects on real wages of a change in the real minimum wage on salaried workers. The results are broadly consistent with Neumark, Schweitzer, and Wascher (2000). Around the minimum wage, those earning 0.7–0.9 minimum wages, the effect is high for salaried workers; 0.87 of the rise in minimum wages is communicated to wages. Moving

12. Neumark argues that, generally speaking, the lag has the usual interpretation as long as the individual history is not relevant, that is, that the contemporary effect of a change in the minimum wage does not depend on past wages. The problem that he highlights is that a rise in the minimum wage in the previous period may have "swept up" a worker into a different category. Therefore, the correct total effects (contemporaneous plus lagged) needs somehow to compensate for individuals changing classification, which involves generating a set of representative workers in each cell.

up the income scale, the effect remains significant for up to four minimum wages, although with decreasing coefficients and falling to only 0.16 for those earning more than four minimum wages. What is remarkable is that the effect dies off much more slowly than in the United States. Between two and three minimum wages, Neumark, Schweitzer, and Wascher (2000) found an impact of only 0.06 percent, whereas in Colombia at four minimum wages the impact is 0.38. This suggests a far greater *numeraire* effect and hence substantially greater impact of the minimum wage on the overall distribution. As Neumark, Schweitzer, and Wascher (2000) found, very large effects are found below the minimum wage, and we also do not have an obvious explanation for this. The self-employed show a significant effect below the minimum wage, but overall, there appears to be little impact on the distribution above the minimum wage. This suggests that the impact is not through the minimum wage acting as a general signal of price rises throughout the economy.

The effect of a one-quarter lag suggests two interesting effects. First, across the wage distribution there is a significant, and broadly uniform (about 17 percent), erosion of the first period effect, perhaps due to inflation. This suggests that we cannot take the impact effect as the wage rise that firms will use in making employment decisions. Second, again the impact on the self-employed is virtually never significant, and the magnitudes are roughly one-third of those for salaried workers. This suggests that not only do the self-employed not respond strongly to lighthouse effects but that they may update their "wages" frequently to avoid inflation erosion. This, in fact, may be one of the advantages of being self-employed versus salaried in high inflation environments.

1.4.2 Effects on Employment

Table 1.4 shows the consequent effects on employment. Equation (2) is run again, but this time as a logit, where the individual is assigned a value of 1 if he retains his job and a 0 if he is without a job in the second quarter.

The results are consistent with the wage regressions. A rise in the minimum wage has a statistically very significant impact on the probability of becoming unemployed that again decreases with a rising position in the wage distribution. The lags echo this pattern and suggest that, as might be expected, the adjustment does not take place instantaneously. On average, the contemporaneous effect is roughly twice that found by Neumark, Schweitzer, and Wascher (2000) for the United States and, again, extends far higher in the distribution. Corresponding to the apparent impact on the wages of the very lowest ranges of the self-employed distribution, there are negative impacts on employment as well as some impacts higher in the distribution. Figure 1.3 graphs both the impact on wages and unemployment probability by position in the distribution.

The regressions, therefore, suggest statistically very significant effects on

Table 1.4 **Colombia: Effect of a 1 Percent Rise in the Minimum Wage on the Probability of Becoming Unemployed**

Salary in terms of Minimum Wage	Self-Employed	Lag	Salaried	Lag
0.0–0.5	–0.2259***	–0.2205***	–0.3566***	–0.3462***
0.5–0.7	–0.2207***	–0.2160***	–0.3151***	–0.3035***
0.7–0.9	–0.1611**	–0.1541**	–0.2715***	–0.2615***
0.9–1.1	–0.0921	–0.0847	–0.2765***	–0.2595***
1.1–1.3	–0.1182	–0.1206*	–0.2298***	–0.2169***
1.3–1.5	–0.1378*	–0.1327**	–0.2933***	–0.2890***
1.5–2.0	–0.1044	–0.0988	–0.0967	–0.0623
2.0–3.0	–0.0620	–0.0505	–0.1962**	–0.1675**
3.0–4.0	–0.0408	–0.0343	–0.2530***	–0.2204**
>4.0	–0.0695	–0.0653	–0.1969*	–0.1933**
N	3,128		5,835	

Notes: Sample includes men who work thirty–fifty hours per week. *N* = number of observations.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

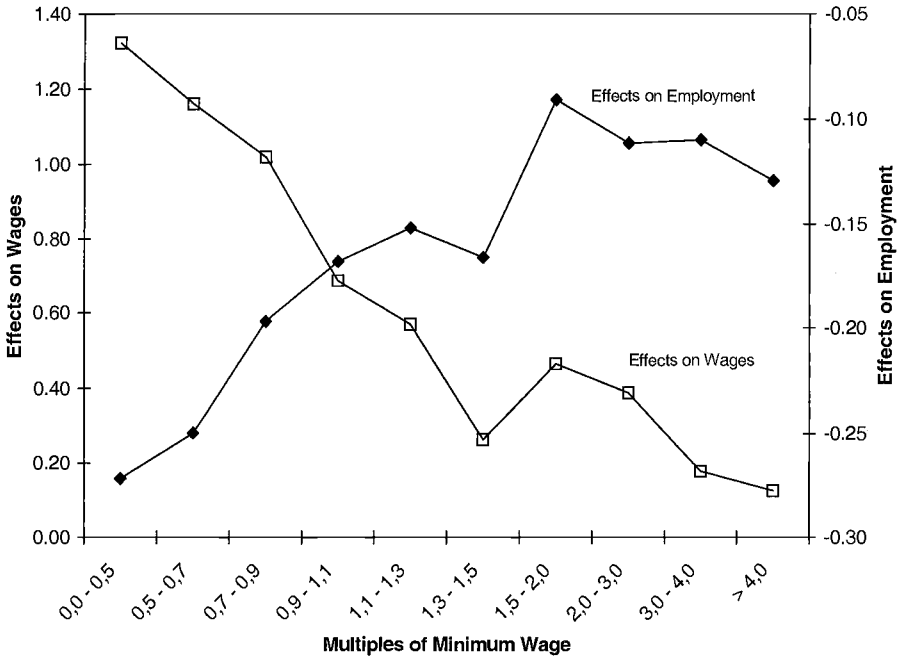


Fig. 1.3 **Colombia: Impact of minimum wage on wages and employment**

employment and magnitudes of effect far larger than those seen in the United States. However, because they measure the impact on the flow out of employment, they cannot answer the question of what happens to the total stock of jobs. As a very rough first approximation, we run equation (2) again—eliminating the **R** dummies (leaving only the constant) so as to get the "average" effect of the minimum wage rise—effectively integrating under the wage distribution in table 1.3. The average contemporaneous impact is 0.64 and lagged is –0.17, leaving a total effect of 0.47 percent rise in wages. We then multiply this by the Fajnzylber and Maloney (2001) estimate of the long-run own-wage elasticity of blue-collar manufacturing employment of 0.32. If there is no further inflationary erosion, this would imply an elasticity of employment with respect to minimum wage of 0.15. This is quite consistent with Bell's (1997) estimates and suggests that the 9 percent rise in minimum wage in 1999 would have had the effect of reducing employment by 1.4 percent.

1.5 Conclusion

The Colombian case confirms the evidence offered by the kernel density estimates. First, the minimum wage can have an important impact on the wage distribution in the neighborhood of the minimum wage. Second, the effects echo up the wage distribution in a way that suggests important *numeraire* effects. That this effect is far stronger than found by Neumark, Schweitzer, and Wascher (2000) in the United States suggests that the minimum wage induces farther-reaching rigidities in the labor market and that the trade off between any possible effect on poverty and reduced flexibility is likely to be more severe in Latin America. The employment effects are shown to be large as a result. The data did not allow testing of the impacts on informal salaried sector wages, but the kernel density plots speak convincingly about the lighthouse effect and the potentially greater impact on the informal sector. In sum, the minimum wage has impacts both in the higher reaches of the formal distribution and in the informal labor markets that magnify its distortionary effects beyond what was previously thought.

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