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Minimum wage violations in Honduras

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Abstract

This article studies minimum wage non-compliance in Honduras, a dual labor market with high wage floors that are weakly enforced. However, rather than just counting how many workers earn sub-minimum wages, it also estimates violation indices that measure compliance at the intensive margin. I first explore cross-sectional heterogeneity in violations using household survey data. Then, I quantify compliance adjustments to minimum wage hikes by comparing indices before and after a large unexpected increase. Results show substantial differences in non-compliance across industries, location, and coverage status. Violations worsen with rising minima, but less in in more compliant sectors.

JEL classification codes: J38, J42, O54

Keywords: Minimum wages, Compliance, Violations, Dual labor markets, Honduras

1 Introduction

Most countries protect vulnerable workers through labor market institutions, including minimum wages.[1] However, just because labor laws exist does not guarantee compliance, especially when doing so is costly and their enforcement weak (Ronconi 2010). Therefore, researchers frequently encounter that employers are paying wages below mandated minima. Existing estimates report that 16–50% of developing country workers earn sub-minimum wages (Rani et al. 2013). Moreover, this non-compliance tends to be heterogeneous within countries, depending on institutional factors, industry-specific attributes, location, and worker characteristics.

Unfortunately, the majority of the minimum wage literature has provided scant attention to enforcement and compliance. This is troubling because small changes in enforcement may lead to vastly different consequences of minimum wage hikes (Basu et al. 2010). Since modifying wage floors is controversial because they pose an equity-efficiency tradeoff, enforcement and compliance issues warrant further discussion because they help determine which effect dominates.

Studies that analyze non-compliance often calculate how many workers earn less than the minimum wage. While this measure is useful, it tells an incomplete story since individuals earning just below the minimum and those paid much less are equally weighted. For example, a construction worker earning one percent below the minimum counts the same as a seasonal farm worker that makes only half the wage floor. Both employees

are underpaid but find themselves in two clearly different situations, which the standard measure of non-compliance is unable to identify.

Bhorat et al. (2013) recently proposed using the Foster et al. (1984) poverty measures to provide evidence on the incidence, depth, and severity of non-compliance with minimum wages. Their use helps distinguish between compliance at *extensive* and *intensive* margins. Extensive compliance counts how many workers receive sub-minimum wages, just like the traditional measure. Intensive compliance, however, quantifies how far individual wages are from mandated minima. These measures are known as the family of minimum wage violation indices.

This article estimates these indicators on household survey data from Honduras. The country sets multiple minima that have differed across regional, industrial, and firm-size categories. Additionally, minimum wages only cover some workers. Following Honduran legislation, I define covered employees as private-sector wage earners and uncovered workers as the self-employed. Jointly, these occupations represent more than two thirds of the total workforce. The data cover seven years (2005–2011), providing information on more than 150,000 workers (approximately 22,000 per year).

Using this data, I investigate two issues. First, I explore heterogeneity in industry-level compliance, highlighting urban-rural differences and duality in minimum wage coverage. Second, since previous literature is mainly concerned with how variations in enforcement affect compliance, I instead focus on how higher minimum wages change extensive and intensive compliance by taking advantage of a large unexpected increase.

Findings from this study contribute to previous literature by providing new estimates of minimum wage violations and their depth. While a few studies have analyzed heterogeneity in compliance, further evidence is required to fully understand this phenomenon. Moreover, there remains almost no knowledge about whether and how compliance responds to rising wage floors. Lastly, the broader minimum wage literature may benefit from a more profound study of compliance since it is a key dimension of this policy. Addressing these gaps would help researchers better understand minimum wages in developing countries and inform policymakers on how to enhance the tractability of labor market institutions.

Results show substantial heterogeneity in non-compliance across industries, location, and coverage status in Honduras. Despite a generalized level of violations, some industries comply more than others, especially in urban areas. Findings also support that the depth of non-compliance captures different factors than its incidence. Compliance worsens after minimum wage hikes, since violations at the extensive and intensive margin increase significantly. There is suggestive evidence of partial compliance in the urban covered sector but it seems minimum wages are not complied with in the rural covered sector and for uncovered workers.

The remainder of this paper is organized as follows. Section 2 reviews the literature on minimum wage compliance in developing countries. Section 3 describes the Honduran labor market and its minimum wage policy. Section 4 presents the data and empirical strategy. Section 5 analyzes heterogeneity in minimum wage compliance. Section 6 studies how extensive and intensive compliance respond to a large minimum wage hike. Finally, Section 7 concludes and discusses directions for future research.

2 Minimum wage compliance in developing countries

An implicit assumption when setting minimum wages is that there will be full compliance. Empirically, this is not always true. Ashenfelter and Smith (1979) first debunked this myth in the US, finding that over a third of workers earned sub-minimum wages. Therefore, the outlook for complete compliance is less encouraging in developing countries where enforcement is more lax (Grimshaw and Miozzo 2003).

Non-compliance usually arises because enforcement is weak and compliance costly to firms.[2] Incentives to comply depend on a) the level of minimum wages compared to average wages, b) the elasticity of labor demand, and c) the associated penalties. Further complexities develop when countries set multiple minimum wages that vary across regions (Ashenfelter and Smith 1979), industries (Asongu and Jellal 2015), and where only some workers are covered (Maloney and Mendez 2004).

Basu et al. (2010) discuss the role of enforcement and compliance when evaluating minimum wage policies. They show that labor market effects will depend on both the value of minima and their enforcement level. Hence, two countries with the same wage floor but different levels of compliance may experience substantially different consequences. Unfortunately, most minimum wage studies grant insufficient attention to these issues. Only recently has some research begun to address this gap.

Descriptive studies include Maloney and Mendez (2004), Rani et al. (2013), and Del Carpio and Pabon (2014). Estimates show that between 16–50% of workers are paid below mandated minima, so full compliance is not supported by the data. Additionally, these rates tend to differ between and within countries (Neumark and Wascher 2008). Compliance levels seem to depend on specific features of the labor market, including institutional factors, industry-specific attributes, location, and worker characteristics.

Other work has focused on estimating the causal effect of higher enforcement on compliance. Ronconi (2010) finds that increasing the number of labor inspectors in Argentina raises minimum wage compliance. Similar findings are reported for Brazil (Almeida and Carneiro 2009) and Costa Rica (Gindling et al. 2015), but no relationship is found in South Africa (Bhorat et al. 2012a). Some of these studies also find that higher compliance may lead to employment declines. Therefore, non-compliance may be tolerated by governments to mitigate job loss, leading to an equilibrium state with partial minimum wage compliance (Dinkelman and Ranchhod 2012).

The majority of this evidence is obtained by counting how many workers earn sub-minimum wages. As previously mentioned, this fails to capture the depth of non-compliance. To overcome such issues, Bhorat et al. (2013) proposed using the axiomatic FGT poverty measures (Foster et al. 1984) as "violation indices". Under this view, the main outcomes are wages and the poverty line is the mandated wage floor. These violation indices summarize how many workers are underpaid (incidence) but also how far their wages are from the minimum (depth), allowing us to distinguish between compliance at extensive and intensive margins.

Since the introduction of these indices, several papers have quantified them. Bhorat et al. (2012b) study the case of South Africa, where they find that on average, 44 percent of workers earn sub-minimum wages and these individuals have an average shortfall that is 35% of the minimum wage. Rani et al. (2013) estimate that workers in their sample of eleven countries are underpaid between 25–50%, or equivalently, earn at most 0.50–0.75 of the minimum wage. Kanbur et al. (2013) evaluate violations in Chile, finding that 18.2%

of workers are paid below the minimum, with an average shortfall of 24.5%. Most of these studies find heterogeneity in violations and their depth across industries and employee characteristics.

Not all available research is solely concerned with estimating the indices. For instance, Bhorat et al. (2012a) evaluate the determinants of the incidence and depth of non-compliance. Their results indicate that a variety of factors impact on minimum wage violations, including individual, industry, firm-level/contractual, and spatial characteristics. Some of these attributes are found to be significant markers for the incidence of non-compliance, but not its depth.

Overall, the compliance literature has provided three main findings. First, while stricter enforcement can raise compliance, it may also lower employment. Hence, some non-compliance may be tolerated to achieve distributional goals. Second, we should be concerned both with the incidence of non-compliance and its depth since they are determined by different underlying factors. Last, there is marked heterogeneity in compliance rates within countries. However, other directions need to be explored. On one hand, while existing studies analyze heterogeneity across industries, fewer have focused on disparities across location and coverage status. On the other, there remains almost no evidence on whether and how extensive and intensive compliance respond to rising minima. In what follows, I investigate these matters using data from Honduras.

3 Honduras's labor market and minimum wage policy

Honduras is the third poorest country in Latin America after Haiti and Nicaragua (Cordero 2009). In 2012, 61% of the adult population (15–65) was in the labor force, of which 58.5% were employed and 4% unemployed. Employed individuals are occupied in four broad categories: wage earners (42.5%), self-employed (35.5%), unpaid family workers (11.2%), and employers (10.8%).

Minimum wages have been part of the labor code in Honduras since 1974. They are regulated by the General Directorate of Wages (DGS, in Spanish), which belongs to the Ministry of Labor and Social Security. Mandated minima are negotiated each year by a commission of Government, employer, and worker representatives. If no agreement is achieved, a final decision is taken by the executive branch. Official minimum wages are then published as decrees in the Senate's Newspaper, *La Gaceta*.[3]

From the legislation, we may identify some distinctive characteristics of Honduran wage minima. First, multiple minimum wages exist at the same time. Up to 37 different wage floors have coincided, varying by location, industry, and firm size. Second, Honduras sets daily floors. According to the DGS, full-time employees should be paid 30 daily minimum wages per month. Third, the covered sector consists of wage earners in private firms.[4] This implies that the self-employed, unpaid family workers, and employers are not covered by minimum wages. Fourth, workers who receive food or housing may be paid 80% of the minimum and 70% if provided both. Last, average minimum wage changes are indexed to inflation and productivity.

Figure 1 plots mean minimum wages, living costs, and the poverty line, beginning in 1990 for which data on all three concepts are available. Average minimum wages in Honduras have usually been set above the poverty line, but systematically below the estimated cost of living. Three broad periods may be discerned from the figure. First, from 1990–1998, average minimum wages were relatively unchanged. Second, increases were

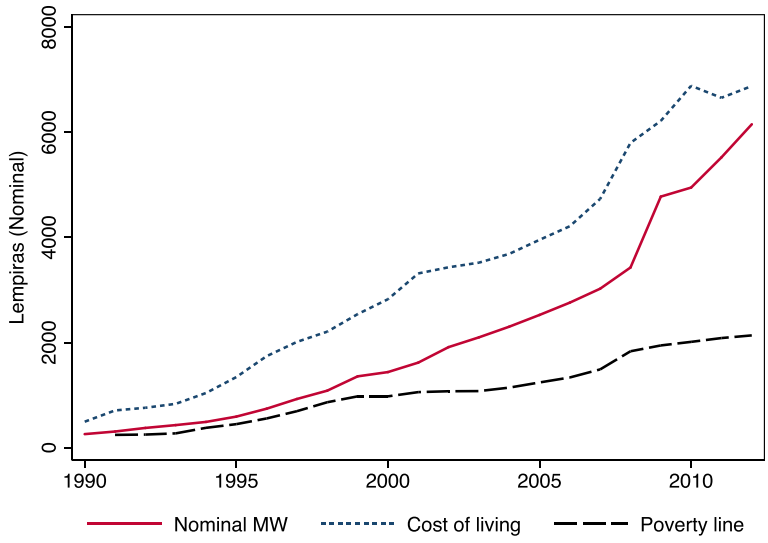

Fig. 1 Honduran minimum wages, cost of living, and the poverty line, 1990–2012. Source: General Directorate of Wages, Ministry of Labor. http://www.trabajo.gob.hn/organizacion/dgt-1/direccion-general-de-salarios/leyes-y-acuerdos-sobre-fijaciondel-salario-minimo

higher during 1999–2008, stabilizing average minima between the poverty line and living costs. Finally, mean wage floors have risen substantially in recent years.

Figure 2 depicts these patterns more clearly by presenting the ratio of average minimum wages to mean wages and living costs. In comparison to other Latin American countries, wage floors have more bite in Honduras (Maloney and Mendez 2004). Moreover, they have increased significantly throughout the period, especially in 2009.

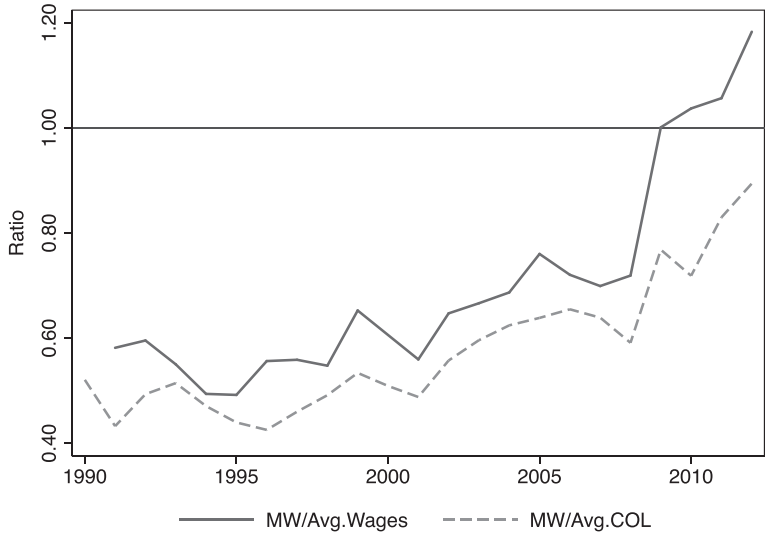

Fig. 2 Ratio of average minimum wages to mean wages and cost of living, 1990–2012. Source: General Directorate of Wages, Ministry of Labor. http://www.trabajo.gob.hn/organizacion/dgt-1/direccion-general-de-salarios/estadisticas

In that year, president Manuel Zelaya decreed a 50 percent increase in the average real minimum wage when negotiations between commission members broke down. Additionally, the structure of minimum wages was modified to facilitate their delivery. It went from 19 minima set by industry firm-size categories to 2 regional floors, urban and rural.[5] This policy gave no time for anticipation effects, since it was announced on December 23rd, decreed on the 27th, and took effect four days later.[6] Furthermore, it was unrelated to aggregate economic and labor market conditions, as (Ham, A: The Effects of Minimum Wages in Dual Labor Markets with Non-Compliance: Evidence from Honduras, unpublished) shows.

How are minimum wages enforced? Honduras has 130 inspectors in 20 regional offices to monitor labor code violations. This falls just short of the inspector per worker threshold recommended by the ILO (Ronconi 2012).[7] Employers are randomly visited to assess compliance with minimum wages and other regulations. When firms commit an infraction, they are charged fines between 1000–5000 Lempiras (US$50–250), which may be higher depending on the type of firm. Penalties apply for the incidence of minimum wage violations, but are unrelated to the depth by which workers are underpaid. Gindling and Terrell (2009) find evidence of effective enforcement in the large firm covered sector, but not for small firms or the uncovered sector.

We should expect such high minima that are weakly enforced to result in non-compliance. In fact, this is what previous studies find. Gindling and Terrell (2009, and 2010) estimate that 30.6% of covered wage earners earn sub-minimum wages, with higher non-compliance by small firm employers. In a companion paper (Ham, A: The Effects of Minimum Wages in Dual Labor Markets with Non-Compliance: Evidence from Honduras, unpublished), I estimate these measures on more recent data and find that the average incidence of violations in the covered sector has risen to 44.1%, and is worse in the small firm covered sector and rural areas. However, several questions remain unanswered by Honduran minimum wage research: i) how heterogeneous is compliance across industries?, ii) what is the depth by which workers are underpaid?, and iii) how did the incidence and depth of violations respond to the 2009 minimum wage update?

4 Data, sample, and empirical strategy

4.1 Data

To answer these questions, I employ nationally representative data from Honduras's *Encuesta Permanente de Hogares de Propósitos Múltiples* (EPHPM). EPHPM surveys are conducted by the National Statistics Institute (INE) two times per year, in May and September. They gather detailed individual-level information on wages and employment for the Honduran population. Twelve waves from 2005–2011 are joined for this study.[8] All variables of interest are identically defined to ensure comparability across waves.

The survey data are complemented with minimum wage values published in *La Gaceta* and consumer price indices from the Honduran Central Bank to deflate minima and wages.[9] Using the decrees, I assign the corresponding wage floor to each worker based on their self-reported industry and firm size. Since the surveys identify whether individuals receive food and/or housing from their employer, minimum wages are adjusted for these offsets. Following Gindling and Terrell (2009), I construct real hourly minimum wages by calculating deflated monthly values and computing Hourly MW = Monthly MW $/(44 \times 4.3)$.[10]

4.2 Sample

The analysis will focus on covered and uncovered workers in Honduras. Following the decrees, the former encompass private-sector wage earners and the second consist of the self-employed.[11] About 70% of all workers are occupied in these categories, each representing roughly a third of total employment. I further restrict the sample to adults (15–65) working at most 72 h per week and whose wages lie below the 99th percentile. This leaves complete data for 102,599 covered employees and 52,056 uncovered workers.

Individuals are further identified by location to enrich the analysis. As argued by Gindling and Terrell (2009), resources devoted to guarantee minimum wage compliance in Honduras are limited, especially away from large cities. Approximately 55.5% of the sample lives in urban areas. Covered employees are mostly located in cities, while uncovered workers are a slight majority in rural Honduras. The four main *worker types* I consider are distributed as follows: urban covered (37.9%), rural covered (26.3%), urban uncovered (17.7%), and rural uncovered (18.1%).

The minimum wage decrees specify wage floors for ten industries: agriculture, mining, manufacturing, utilities, construction, retail, transport, banking, services, and the export (or maquila) sector. Table 1 presents the distribution of worker types across industries. Urban covered employees in Honduras mostly work in retail, manufacturing, and the maquila sector. Rural wage earners work in agriculture, construction, and retail. Urban uncovered workers are typically employed in retail and manufacturing. Finally, the rural self-employed are predominantly working agricultural and retail jobs.

4.3 Empirical strategy

To study the incidence and depth of minimum wage non-compliance in Honduras, I use the violation indices proposed by Bhorat et al. (2013). They are usually represented by V_α, where $\alpha = \{0, 1, 2\}$. Intuitively, the indices take individual violations of minimum wages and aggregate them similarly to the FGT measures of poverty:

$$V_\alpha = \mathbb{E}\left[v(w^m, w)\right] = \mathbb{E}\left[\left\{\frac{(w^m - w)}{w^m}\right\}^\alpha\right]$$

Table 1 Distribution of worker types by industry, average for 2005–2011

	Covered		Uncovered	
Industry	Urban	Rural	Urban	Rural
Agriculture, fishing, and hunting	5.03	52.39	4.05	40.87
Mining	0.22	0.62	0.22	0.39
Manufacturing	15.75	9.09	15.28	10.99
Utilities	0.52	0.40	0.06	0.02
Construction	10.86	10.02	4.66	2.43
Retail, hotels, and restaurants	28.44	9.55	47.49	30.76
Transport, storage, and communications	5.11	2.64	7.91	2.48
Banking, financial, and real estate services	9.70	2.31	3.28	0.53
Communal, social, and personal services	11.97	5.08	11.98	7.80
Export sector (Maquila)	12.40	7.88	5.06	3.74
TOTAL	**100.00**	**100.00**	**100.00**	**100.00**

Source: Own calculations from pooled EPHPM surveys for 2005–2011
Notes: All statistics are weighted using survey provided expansion factors. Following Honduran minimum wage decrees, covered employees are defined as private-sector wage earners and uncovered workers are the self-employed

Here, w^m is the hourly minimum wage and w is the actual hourly wage for workers in the sample. The value of α captures differing degrees of "violation aversion". Therefore, $\alpha = 0$ counts the fraction of workers that earn less than the minimum, $\alpha = 1$ quantifies the gap between actual pay and mandated minimum wages expressed as a fraction of the minimum, and $\alpha = 2$ squares this gap to give more weight to large deviations. In what follows, I refer to these measures as the incidence (V_0), depth (V_1), and severity (V_2) of non-compliance, respectively.

Since V_1 and V_2 are not directly interpretable, I also provide estimates of an alternative indicator used by Bhorat et al. (2013) to quantify the depth of minimum wage non-compliance: V_1/V_0. This ratio captures the percentage shortfall in the average pay of underpaid workers from the minimum wage. In other words, workers earning less than the mandated wage floor are paid on average V_1/V_0 percent below the minimum.

I bootstrap V_0, V_1/V_0, and their changes to determine whether estimated differences in extensive and intensive compliance are statistically significant. Therefore, point estimates will be accompanied by 95% confidence intervals obtained from 500 replications.[12]

Estimates are presented in two parts. First, cross-sectional indices are calculated to explore industry-level heterogeneity in minimum wage violations across location and coverage status. The findings will characterize minimum wage non-compliance in the Honduran labor market. Second, the time frame is split into two sub-periods, before and after 2009, to study the effect of higher minimum wages on extensive and intensive compliance. These results will identify which industries complied with the policy and which ones did not by measuring changes in the incidence of violations (ΔV_0) and their shortfall ($\Delta V_1/V_0$).

5 Heterogeneity in minimum wage violations

Before proceeding to the indices, Table 2 shows average real minimum wages (w^m) and actual wages (w) by industry for each worker type. During the period, average minima were 9.39 Lempiras an hour, about US$0.94. Ratios between average wages and the minimum for urban and rural covered (wage earning) employees are 1.47 and 0.85, respectively. Uncovered (self-employed) workers earn slightly less than wage earners and follow similar patterns across location. Estimated ratios for the self-employed are 1.40 in urban areas and 0.83 in the rural sector. Therefore, Honduran workers located in cities have average earnings above mandated wage floors while rural laborers do not.

The table also highlights wage differences across industries. For instance, rural covered workers employed in agriculture, construction, and retail earn below their corresponding minimum but above this value in all remaining industries. Similar behavior may be inferred from analyzing other worker types. This suggests that some industries are complying with minimum wages more than others.

Another approach to describe minimum wage compliance is to plot wage distributions. Given the multiplicity of wage floors in Honduras, Fig. 3 plots kernel density estimates of the distribution of log hourly wages minus log minimum wages. This recenters the distribution so that $0 = MW$. If minima are enforced for a particular worker type, we should see censoring from below at zero and a higher spike at this value compared to other types.

Table 2 Real minimum wages and actual wages by industry, average for 2005–2011

		Covered		Uncovered	
Industry	Minimum wage	Urban	Rural	Urban	Rural
Agriculture, fishing, and hunting	8.38	9.48	5.96	6.43	5.04
Mining	9.56	14.23	11.71	13.06	6.13
Manufacturing	9.74	13.19	10.41	10.34	8.36
Utilities	11.02	16.40	11.86	9.43	6.53
Construction	9.52	11.15	8.83	14.81	12.57
Retail, hotels, and restaurants	9.64	12.44	9.09	13.37	9.74
Transport, storage, and communications	10.03	16.32	10.98	15.05	14.17
Banking, financial, and real estate services	10.64	18.28	11.68	26.21	17.88
Communal, social, and personal services	9.80	19.00	11.61	12.90	9.47
Export sector (Maquila)	9.18	12.41	11.08	11.75	7.19
Average	**9.39**	**13.84**	**7.97**	**13.11**	**7.76**

Source: Own calculations from pooled EPHPM surveys for 2005–2011
Notes: All statistics are weighted using survey provided expansion factors. Values are deflated using the Honduran Central Bank's Consumer Price Index (Dec. 1999 = 100). The average real exchange rate for the period is approximately 10 Lempiras per 1 USD. Following Honduran minimum wage decrees, covered employees are defined as private-sector wage earners and uncovered workers are the self-employed

Spikes at the minimum wage are only evident for covered employees, especially in urban areas. As expected in a labor market with high minima and weak enforcement, a sizable fraction of wage earners are paid sub-minimum wages. Uncovered sector wage distributions show no sign of censoring at mandated minima and look very close to a normal distribution, denoting that wage floors do not bind for self-employed workers. Despite this fact, I maintain uncovered workers in the analysis to highlight wage differentials across sectors.

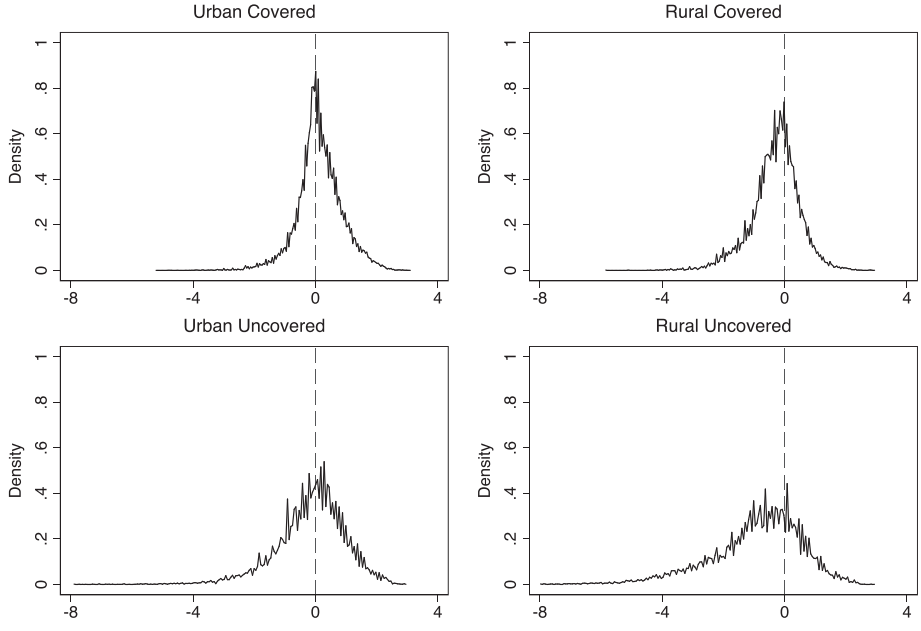

Fig. 3 Kernel density distributions of log wages minus log minimum wages, average for 2005–2011. Source: Own calculations from pooled EPHPM surveys for 2005–2011. Weighted estimates. 0 represents the minimum wage

I now turn to the family of minimum wage violation indices (V_α) to quantify the extent and depth of these violations. Recall that V_0 captures compliance at the extensive margin and V_1/V_0 measures violations at the intensive margin.

Table 3 presents estimates of V_0, V_1, V_2, and V_1/V_0. Panel A refers to covered employees and Panel B to uncovered workers. Results indicate a generalized level of non-compliance. In ascending order, 42.8% of the urban covered, 51.8% of the urban uncovered, 65% of the rural covered, and 72% of rural uncovered workers earn sub-minimum wages. The depth of these violations follow a similar pattern. In urban areas, covered workers earn on average 32.4% below the minimum and the uncovered 50.5%. Shortfalls from the minimum are significantly worse in rural areas, where covered and uncovered workers are underpaid by 43.1% and 64.1%, respectively.

Point estimates for the main violation indicators and their confidence intervals are shown in Figs. 4 and 5. The dotted line plots the means in the preceding paragraph as a reference point to compare industry-level deviations from average non-compliance.

Even though urban workers earn average wages above the minimum, non-compliance fluctuates across industries. For instance, more than half the wage earners are employed in retail, manufacturing, or construction; which have above average incidence of violations. In turn, the transport, banking, services, and maquila industries

Table 3 Minimum wage violation indices, average for 2005–2011

	Urban				Rural			
Industry	V_0	V_1	V_2	V_1/V_0	V_0	V_1	V_2	V_1/V_0
Panel A: Covered sector (Wage Earners)								
Agriculture, fishing, and hunting	0.638	0.279	0.161	0.437	0.773	0.365	0.219	0.472
Mining	0.409	0.192	0.119	0.469	0.558	0.204	0.108	0.366
Manufacturing	0.450	0.144	0.069	0.320	0.479	0.166	0.085	0.346
Utilities	0.456	0.132	0.055	0.289	0.587	0.219	0.109	0.374
Construction	0.538	0.212	0.119	0.394	0.605	0.254	0.147	0.419
Retail, hotels, and restaurants	0.463	0.147	0.071	0.319	0.549	0.212	0.113	0.385
Transport, storage, and communications	0.358	0.113	0.055	0.314	0.457	0.181	0.098	0.395
Banking, financial, and real estate services	0.353	0.088	0.034	0.249	0.478	0.135	0.059	0.283
Communal, social, and personal services	0.286	0.098	0.050	0.344	0.487	0.210	0.122	0.432
Export sector (Maquila)	0.361	0.080	0.030	0.221	0.438	0.091	0.034	0.209
Average	**0.428**	**0.139**	**0.068**	**0.324**	**0.650**	**0.280**	**0.162**	**0.431**
Panel B: Uncovered sector (Self-Employed)								
Agriculture, fishing, and hunting	0.779	0.567	0.467	0.729	0.851	0.627	0.518	0.738
Mining	0.500	0.196	0.106	0.391	0.810	0.409	0.276	0.506
Manufacturing	0.618	0.330	0.222	0.534	0.669	0.377	0.261	0.564
Utilities	0.634	0.410	0.291	0.647	-	-	-	-
Construction	0.346	0.124	0.067	0.360	0.388	0.163	0.101	0.421
Retail, hotels, and restaurants	0.507	0.251	0.161	0.494	0.631	0.354	0.245	0.561
Transport, storage, and communications	0.402	0.148	0.077	0.369	0.432	0.187	0.108	0.434
Banking, financial, and real estate services	0.236	0.102	0.061	0.431	0.391	0.206	0.135	0.527
Communal, social, and personal services	0.564	0.291	0.188	0.515	0.657	0.351	0.232	0.535
Export sector (Maquila)	0.518	0.250	0.155	0.482	0.761	0.440	0.300	0.578
Average	**0.518**	**0.261**	**0.171**	**0.505**	**0.720**	**0.462**	**0.352**	**0.641**

Source: Own calculations from pooled EPHPM surveys for 2005–2011

Notes: All statistics are weighted using survey provided expansion factors. Following Honduran minimum wage decrees, covered employees are defined as private-sector wage earners and uncovered workers are the self-employed. Estimates are available for industries that have at least 10 observations for each worker type

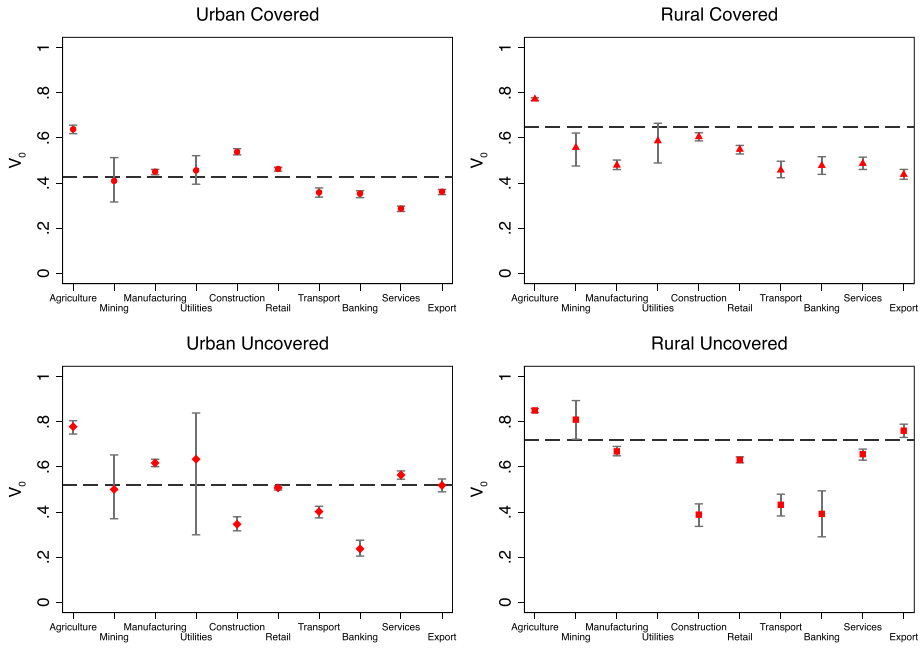

Fig. 4 Incidence of minimum wage violations, average for 2005–2011. Source: Own calculations from pooled EPHPM surveys for 2005–2011. Notes: 95% confidence intervals calculated by 500 bootstrap replications. Estimates are available for industries that have at least 10 observations for each worker type. The dotted line presents the average value of V_0 for each worker type and may be found in the 'Average' rows in Table 3

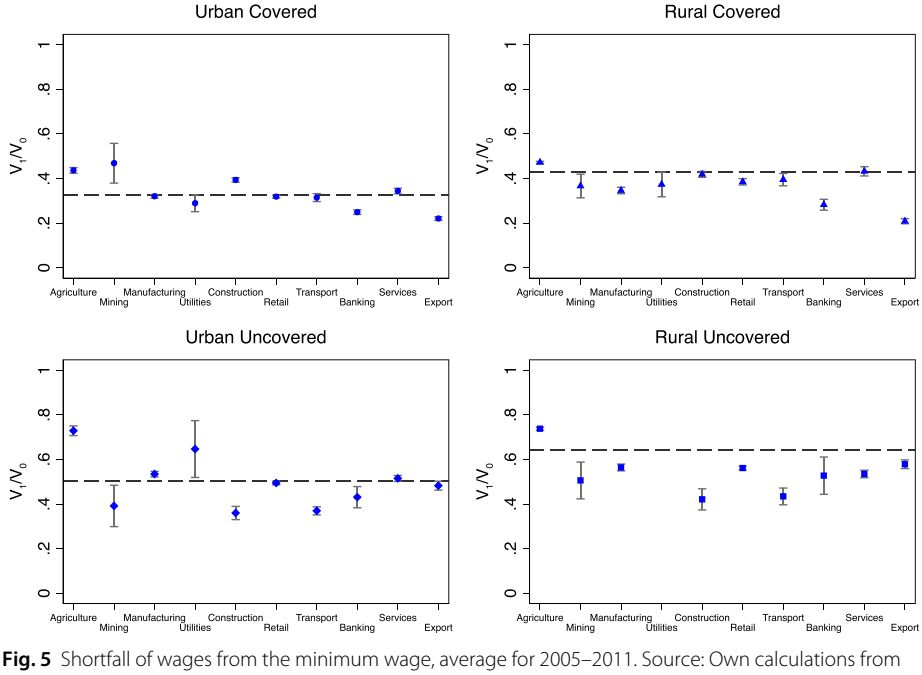

Fig. 5 Shortfall of wages from the minimum wage, average for 2005–2011. Source: Own calculations from pooled EPHPM surveys for 2005–2011. Notes: 95% confidence intervals calculated by 500 bootstrap replications. Estimates are available for industries that have at least 10 observations for each worker type. The dotted line presents the average value of V_1/V_0 for each worker type and may be found in the 'Average' rows in Table 3

are more compliant. Uncovered workers show similar patterns, but violation indices are larger.

Rural workers are also subject to heterogeneous compliance across industries. Covered employees are mostly employed in agriculture, construction, and retail, where non-compliance rates are 77.3%, 60.5%, and 54.9%, respectively. Rural uncovered workers fare worse, since most of them are employed in agriculture where 85.1% are paid less than the legislated minimum wage.

This evidence suggests that industries that employ more individuals are less compliant. Nonetheless, correlation coefficients between employment shares and the incidence of non-compliance are –0.045 and –0.108 and insignificant for covered and uncovered workers in urban areas. In rural Honduras, however, this relationship is positive. Estimated coefficients are 0.598 for covered wage earners and 0.442 for uncovered self-employed workers, and significant for the former. Hence, industries that employ a larger proportion of wage earners in rural areas have higher non-compliance rates.

What about compliance at the intensive margin? In urban areas, estimates of V_1/V_0 reveal sizable differences across industries. Covered workers are underpaid by 32% in manufacturing, 31.9% in retail, and 22.1% in maquilas. Uncovered laborers in retail, manufacturing, and services earn 49.4%, 53.4%, and 51.5% below the minimum wage. In rural areas, the depth of violations is higher across the board. Better paid industries include construction and transport, while agriculture underpays the most. Wage earners receive 47.2% and 38.5% below mandated minima in agricultural and retail jobs. Self-employed workers in agricultural occupations earn 74% below the minimum wage.

This implies that underpaid wage earners make at most 0.78 of the minimum in urban areas and 0.64 in the rural sector. Self-employed workers earning sub-minimum wages make at most 0.79 of this value in cities and 0.58 outside them. Once again, the correlation between industry employment shares and intensive compliance shows that rural industries significantly underpay wage earners, with a coefficient of 0.645.

Do V_0 and V_1 rank industries the same or do they capture different underlying factors? Rank correlations between both measures are high, but imperfect. Coefficients are 0.830, 0.927, 0.988, and 0.891 for urban covered, urban uncovered, rural covered, and rural uncovered workers. Therefore, a high incidence of violations in one industry does not always imply a stronger depth of the violation, especially in the urban covered sector that seems to be complying with minimum wages. In less compliant sectors, incidence and depth are more closely related.

6 Violation responses to minimum wage hikes

In 2009, Manuel Zelaya raised real minimum wages by 50% and changed their structure from industry firm-size categories to location-based floors. Figure 6 shows that this policy induced different increases across industries. Furthermore, urban workers were meant to receive higher wage floors than their rural counterparts.

I examine how extensive and intensive compliance responded to this large increase by comparing violation measures before (2005–2008) and after (2009–2011) the policy. Since minima legally apply to wage earners, I focus the analysis on that sector.

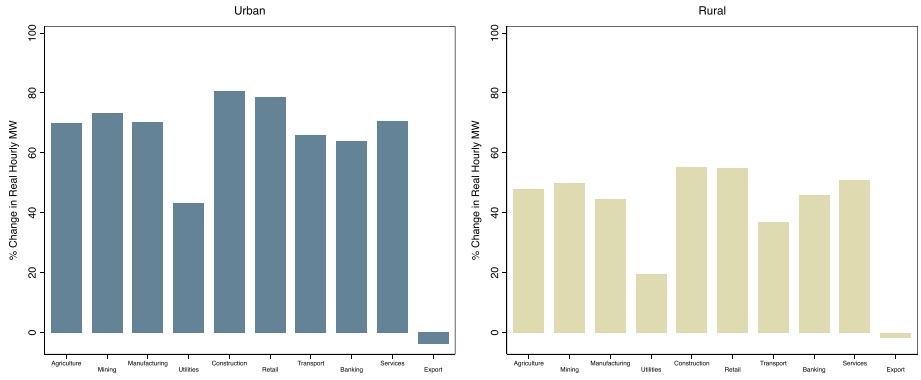

Fig. 6 Industry-level changes in real minimum wages, before and after 2009. Source: Honduran minimum wage decrees, 2005–2011

Before the policy, non-compliance in the covered sector was 33.5% and 58.7% for urban and rural employees, as Table 4 shows. Wage earners made at most 0.72 of mandated minima in cities and 0.61 outside them. Estimates also confirm heterogeneity in compliance across industries, consistent with findings in the previous section.

How do non-compliance rates respond to higher minimum wages? Figure 7 summarizes these results. The average number of covered workers paid below the minimum wage rose

Table 4 Changes in minimum wage violations for covered workers, before and after 2009

	V_0			V_1/V_0		
Industry	Pre	Post	Difference	Pre	Post	Difference
Panel A: Urban areas						
Agriculture, fishing, and hunting	0.538	0.762	0.224	0.376	0.490	0.115
Mining	0.291	0.614	0.323	0.415	0.512	0.097
Manufacturing	0.333	0.618	0.286	0.275	0.355	0.079
Utilities	0.356	0.589	0.233	0.308	0.274	–0.034
Construction	0.404	0.724	0.321	0.325	0.447	0.122
Retail, hotels, and restaurants	0.343	0.607	0.263	0.279	0.346	0.067
Transport, storage, and communications	0.250	0.497	0.247	0.287	0.332	0.046
Banking, financial, and real estate services	0.268	0.461	0.193	0.231	0.263	0.032
Communal, social, and personal services	0.187	0.404	0.217	0.313	0.361	0.048
Export sector (Maquila)	0.391	0.307	-0.084	0.220	0.222	0.002
Average	**0.335**	**0.552**	**0.218**	**0.282**	**0.359**	**0.077**
Panel B: Rural areas						
Agriculture, fishing, and hunting	0.723	0.833	0.111	0.436	0.510	0.074
Mining	0.508	0.616	0.108	0.333	0.399	0.066
Manufacturing	0.404	0.582	0.178	0.293	0.397	0.105
Utilities	0.471	0.692	0.221	0.406	0.354	–0.052
Construction	0.503	0.741	0.238	0.361	0.471	0.110
Retail, hotels, and restaurants	0.461	0.644	0.183	0.333	0.425	0.092
Transport, storage, and communications	0.350	0.580	0.230	0.359	0.421	0.062
Banking, financial, and real estate services	0.457	0.502	0.045	0.254	0.315	0.061
Communal, social, and personal services	0.388	0.597	0.209	0.399	0.457	0.057
Export sector (Maquila)	0.437	0.440	0.003	0.211	0.205	–0.006
Average	**0.587**	**0.727**	**0.139**	**0.392**	**0.469**	**0.077**

Source: Own calculations from pooled EPHPM surveys for 2005–2011
Notes: All statistics are weighted using survey provided expansion factors. Pre refers to 2005–2008 and Post to 2009–2011. Covered workers are defined as private-sector wage earners, following Honduran minimum wage decrees. Estimates are available for industries that have at least 10 observations for each worker type

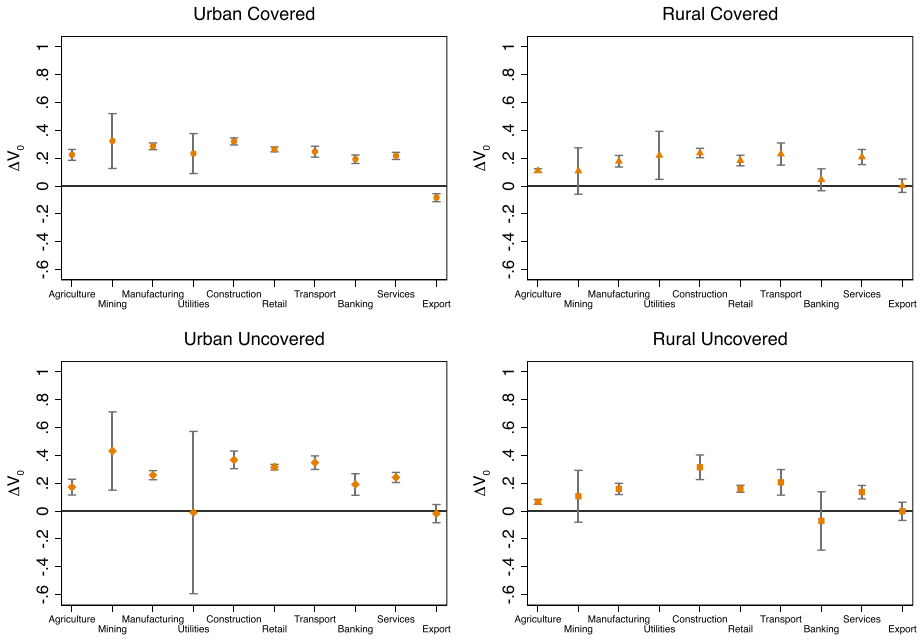

Fig. 7 Changes in the incidence of minimum wage violations, before and after 2009. Source: Own calculations from pooled EPHPM surveys for 2005–2011. Notes: 95% confidence intervals calculated by 500 bootstrap replications. Estimates are available for industries that have at least 10 observations for each worker type. The horizontal line is the benchmark of no change

by 21.8 percentage points in urban areas and 13.9 in the rural sector. While exact changes differ across industries, employers commit more violations after Zelaya's decreed change. Hence, higher minima lower compliance at the extensive margin.

As before, I calculate correlations between industry employment shares and the change in non-compliance rates. For urban employees the coefficient is –0.087 and is not significant. For rural wage earners, the correlation is 0.218. Therefore, there is low negative correlation between the fraction of workers in each industry and extensive compliance in urban areas, but a positive relationship for rural areas.

Figure 8 plots industry-level changes in the depth of non-compliance. On average, wage earners were underpaid by 7.7 percentage points more after the policy. Estimated changes in compliance at the intensive margin are significant, denoting that higher minimum wages lead to higher shortfalls from wage floors. Correlations between the share of covered workers and the depth of non-compliance are positive in both locations. The coefficient is 0.129 in urban areas and 0.390 in rural areas.

How do these findings compare to the uncovered sector? Overall, changes in violations are higher for self-employed workers. The number of individuals earning sub-minimum wages rises by 28.7 and 16.3 percentage points in urban and rural Honduras. Additionally, violation depth grows by 9.7 and 8.2 percentage points, as Table 5 shows.

To best interpret the implications of these changes in compliance, we need to know how labor market outcomes react to changing minimum wages.[13] In related research (Ham, A: The Effects of Minimum Wages in Dual Labor Markets with Non-Compliance: Evidence from Honduras, unpublished), I find effects that are consistent with the dual-sector minimum wage model. The covered sector shows employment declines and higher wages,

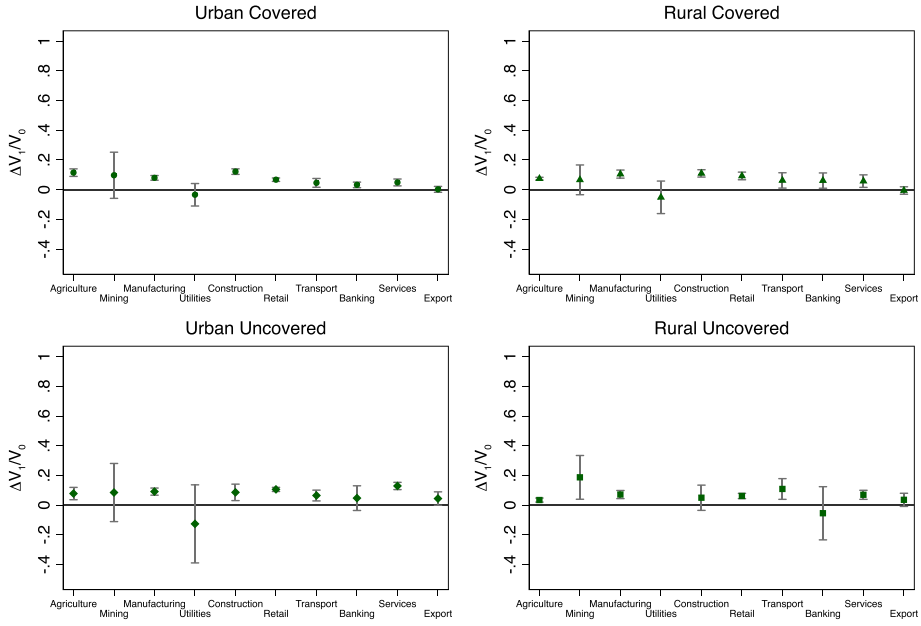

Fig. 8 Changes in the shortfall of wages from minimum wages, before and after 2009. Source: Own calculations from pooled EPHPM surveys for 2005–2011. Notes: 95% confidence intervals calculated by 500 bootstrap replications. Estimates are available for industries that have at least 10 observations for each worker type. The horizontal line is the benchmark of no change

with workers migrating towards the uncovered sector where they lower average wages due to increased labor supply.

While the results in this section reject full compliance with minimum wages, they would support partial compliance if two conditions are met. First, the density at the minimum wage spike in the covered sector wage distribution must be higher after the policy. Censoring from below at this value is not necessary since as Basu et al. (2010) explain, some non-compliance may be tolerated to achieve distributional goals. Second, wage distributions in sectors where minimum wages do not apply should shift to the left, but maintain their shape. To check these conditions, I plot the distribution of log hourly wages minus log minimum wages before and after the wage floor hike in Fig. 9.[14]

In the covered sector distributions, the spike at the minimum wage shows evidence of growth in urban areas. This shift is consistent with the result in (Ham, A: The Effects of Minimum Wages in Dual Labor Markets with Non-Compliance: Evidence from Honduras, unpublished) that average wages increased for covered employees. One interpretation of this finding is that urban employers try to comply with minimum wages, but manage to do so imperfectly. Because these estimates are drawn from repeated cross-sections, higher observed wages may be due to one of three reasons: i) some workers are paid the new minimum wage, ii) some accept higher sub-minimum wages to keep their jobs, and iii) some lose their jobs and are no longer included in the sample to compute average wages. Whatever the reason, the evidence suggests partial compliance in the urban covered sector.

Results for the remaining worker types confirm that rural wage earners and uncovered workers are not receiving minimum wages, evidenced by leftward shifts in their distributions with no visible changes in shape. The uncovered sector is not entitled to minimum

Table 5 Changes in minimum wage violations for uncovered workers, before and after 2009

	V_0			V_1/V_0		
Industry	Pre	Post	Difference	Pre	Post	Difference
Panel A: Urban areas						
Agriculture, fishing, and hunting	0.664	0.836	0.172	0.673	0.751	0.078
Mining	0.341	0.773	0.432	0.343	0.427	0.084
Manufacturing	0.493	0.752	0.258	0.481	0.572	0.091
Utilities	0.639	0.628	–0.010	0.700	0.573	–0.127
Construction	0.190	0.559	0.368	0.301	0.387	0.085
Retail, hotels, and restaurants	0.354	0.671	0.316	0.427	0.532	0.105
Transport, storage, and communications	0.239	0.587	0.348	0.325	0.390	0.064
Banking, financial, and real estate services	0.150	0.341	0.191	0.400	0.447	0.047
Communal, social, and personal services	0.442	0.684	0.242	0.436	0.564	0.129
Export sector (Maquila)	0.526	0.508	–0.018	0.463	0.507	0.044
Average	**0.378**	**0.666**	**0.287**	**0.444**	**0.541**	**0.097**
Panel B: Rural areas						
Agriculture, fishing, and hunting	0.803	0.870	0.067	0.713	0.747	0.034
Mining	0.751	0.858	0.107	0.397	0.584	0.187
Manufacturing	0.589	0.748	0.159	0.524	0.595	0.071
Utilities	-	-	-	-	-	-
Construction	0.243	0.559	0.315	0.388	0.437	0.049
Retail, hotels, and restaurants	0.553	0.713	0.161	0.527	0.589	0.061
Transport, storage, and communications	0.328	0.535	0.207	0.367	0.475	0.108
Banking, financial, and real estate services	0.425	0.355	–0.071	0.551	0.496	–0.055
Communal, social, and personal services	0.588	0.724	0.136	0.496	0.565	0.069
Export sector (Maquila)	0.761	0.760	–0.001	0.564	0.599	0.035
Average	**0.626**	**0.789**	**0.163**	**0.589**	**0.671**	**0.082**

Source: Own calculations from pooled EPHPM surveys for 2005–2011
Notes: All statistics are weighted using survey provided expansion factors. Pre refers to 2005–2008 and Post to 2009–2011. Uncovered workers are defined as self-employed workers, following Honduran minimum wage decrees. Estimates are available for industries that have at least 10 observations for each worker type

wages, so no compliance is expected. However, the rural covered sector shows no signs of compliance, although wage floors should apply to these workers.

7 Conclusions

This article analyzes minimum wage violations at the extensive and intensive margin in Honduras, a developing country with high wage floors that are weakly enforced. Following recent research, I compute the family of indices proposed by Bhorat et al. (2013) on household survey data to investigate two issues. First, I explore cross-sectional heterogeneity in non-compliance. Second, I quantify compliance responses to minimum wage hikes by comparing indices before and after a large unexpected increase.

Cross-sectional findings reveal substantial differences in extensive and intensive non-compliance across industries, location, and coverage status. The urban covered sector is mostly compliant with minimum wage laws but the rural covered and uncovered sectors are not. Moreover, while rural wage earners are legally covered, industries who hire the most workers also have the highest non-compliance rates and underpay the most. Rank correlations support that the depth of non-compliance may be driven by different underlying factors than its incidence, suggesting that both dimensions are relevant to understand how minimum wages work in Honduras.

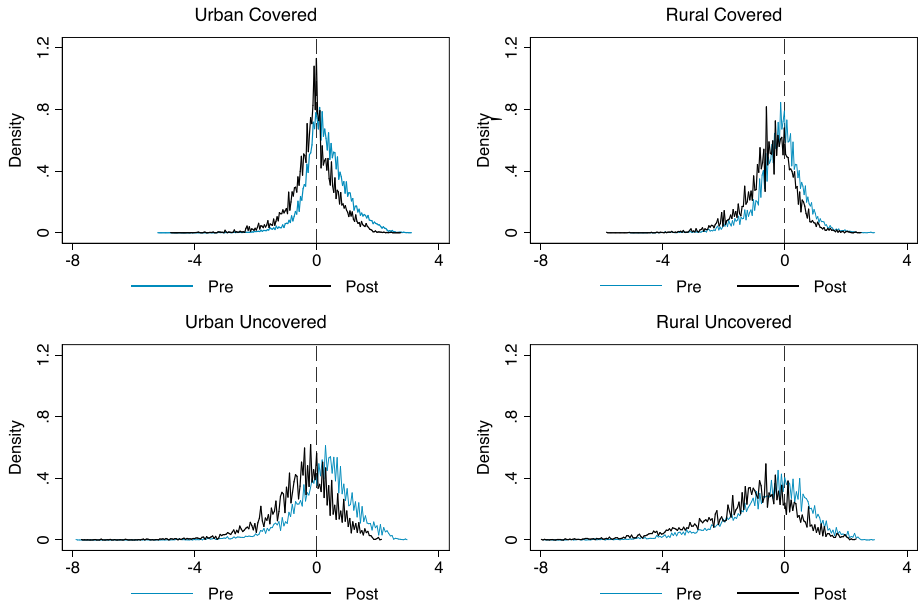

Fig. 9 Kernel density distributions of log wages minus log minimum wages, before and after 2009. Source: Own calculations from pooled EPHPM surveys for 2005–2011. Weighted estimates. 0 represents the minimum wage

Violations increase after minimum wage hikes, since non-compliance at the extensive and intensive margin grows for all workers. There is suggestive evidence of partial compliance only in the urban covered sector. Given the scarce resources devoted to monitoring labor laws and lower enforcement in rural areas (Gindling and Terrell 2009), these results are unsurprising but worrisome. In addition to the finding that rural industries who hire the most workers have the highest non-compliance rates and underpay the most, the rural sector represents a key area for policy intervention.

These results provide new empirical evidence to the literature on compliance with labor institutions. In particular, these estimates may help design enforcement policies, since they identify what industries are committing the most infractions. The successful National Campaign for Minimum Wages in Costa Rica may serve as a starting point (Gindling et al. 2015). Additionally, compliance responses to minimum wage hikes confirm that policy decisions must take into account the value of mandated minima and their level of enforcement (Basu et al. 2010). Lastly, more detailed studies of compliance are necessary to understand the labor market effects of minimum wages. In the case of Honduras, it sets high minimum wages but does not commit resources to enforce them, leading to higher efficiency losses than equity gains (Ham, A: The Effects of Minimum Wages in Dual Labor Markets with Non-Compliance: Evidence from Honduras, unpublished).

Further research is required to fully comprehend compliance with minimum wages and labor laws in general. On one hand, using panel data may shed further light on how compliance adjusts to changing minima and/or higher enforcement. Results from such studies may help understand why some sectors are only partially complying with labor laws. On the other, compliance might also differ between covered workers in 'precarious' jobs often considered to be 'informal' (Gasparini and Tornarolli 2009). Labor informality

is a growing concern in developing countries, and is not restricted solely to the unregulated or shadow economy. Hopefully, more evidence in these and other directions will help researchers and policymakers ensure that labor market institutions fulfill their main objective: to protect the most vulnerable workers.

Endnotes

[1] A summary of other commonly implemented labor institutions may be found in Blau and Kahn (1999).

[2] Ashenfelter and Smith (1979), Grenier (1982), Chang and Ehrlich (1985), and Yaniv (2001) model firm decisions in competitive markets. Yaniv (1988) and Basu et al. (2010) study non-competitive markets.

[3] Minimum wage decrees are publicly available at the DGS website: http://www.trabajo.gob.hn/organizacion/dgt-1/direccion-general-de-salarios#!/tcmbck.

[4] Public-sector wage earners are indirectly covered since they are paid in multiples of the minimum wage. However, these employees are subject to a different wage grid. See Gindling and Terrell (2009).

[5] Industries are defined in the minimum wage decrees using the 1-digit ISIC classification and include: agriculture, mining, manufacturing, utilities, construction, retail, transport, banking, services, and the export (or maquila) sector. Except for the last industry which has one floor, minima were set for small (1–15) and large (16+) firms before the 2009 update. However, further changes have ensued.

[6] Media coverage highlights that employers felt this measure was abruptly "imposed" on them. See http://www.hondurasnews.com/minimum-wage-increase-bad-for-economy/.

[7] In 2012, more than three million Hondurans were active. A simple calculation of the ratio of inspectors to workers yields roughly 1:23,500. Ideally, this relationship should be 1:20,000 (Weil 2008).

[8] Both May and September surveys are used to mitigate seasonality issues. Unfortunately, no survey was carried out in September 2009 due to the country's political crisis.

[9] Most minimum wage changes became effective on the first day of each calendar year, except in 2010, when the update took effect on September 1st. Therefore, the 2009 scheme was still applicable at the time when fieldwork for the May 2010 survey was undertaken.

[10] This procedure takes into consideration that full-time employees must work 44 h per week for 4.3 weeks (which amounts to roughly 30 days). Calculated values for the 19 industry firm-size categories may be found in (Ham, A: The Effects of Minimum Wages in Dual Labor Markets with Non-Compliance: Evidence from Honduras, unpublished).

[11] I omit public-sector wage earners who are indirectly covered, as well as employers and unpaid family workers who are uncovered.

[12] Bootstrapped estimates are only available for industries that have at least 10 observations per worker type. For instance, utility workers in the rural uncovered sector represent only 0.02% of the workforce in these areas or 6 observations from 2005–2011. Since estimated confidence intervals from small sample sizes are imprecise, such cases are omitted.

[13] I would like to thank an anonymous referee for this suggestion.

[14] Another test of partial compliance has been proposed by Dinkelman and Ranchhod (2012). However, it cannot be implemented here because this test is only informative when there are no large employment declines in response to minimum wages, which is not the case in Honduras.

Competing interests
The "Journal of Labor & Development" is committed to the IZA Guiding Principles of Research Integrity. The author declares that he has observed these principles.

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