Low-skilled workers and the effects of minimum wage in a developing country: Evidence based on a density-discontinuity approach

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Abstract

We estimated the impact of the minimum wage on wages, unemployment, and formal-informal sector mobility for women in the domestic-work sector in Uruguay. Applying the density-discontinuity design developed by Jales (2017), we used cross-sectional data for the period 2006–2016 from the National Household Survey and found that the minimum wage had significant effects on labor outcomes, with almost 20% of women increasing their wages to reach the minimum. This effect was observed in both the formal and informal sector, though the latter was not covered by the policy. We also showed a decline in employment in the domestic sector as well as a significant effect on formal-informal sector mobility with negative impacts on formal employment. We present suggestive evidence those effects were offset by other labor policies undertaken in the analysis period.

1. Introduction

The main purpose of minimum-wage (MW) legislation is to protect workers by establishing a livable-wage floor. This tool is considered an important part of redistributive policies aimed at overcoming poverty and reducing economic inequalities (Cruces, Fields, Jaume, & Viollaz, 2017). Nevertheless, the possible consequences of raising the MW have become a topic of interest as well as of controversy, due to possible secondary effects with a potentially negative impact on employment. If that is the case, these policies could have mixed results on the conditions they are intended to improve (Neumark & Wascher, 2007).

The empirical literature on the effects of MW in developed countries is extensive and many studies systematize the evidence concluding that the literature is not decisive regarding the effects of a MW (Neumark & Wascher, 2007; Neumark, 2017; Neumark & Munguia Corella, 2019).1 In developing countries, a number of new studies have appeared, and the debate has focused on the effectiveness of MW in economies with a large informal sector and low-skill workers not covered by MW policy (Marinakis & Bueno, 2014).

In this paper, we aim to contribute to that literature by evaluating the impact of the introduction in 2006 of a MW policy in Uruguay’s domestic-work sector –historically an unregulated sector– on wages, employment, and formal-informal sector mobility for women. The focus on the domestic-work sector is highly relevant in developing countries because it is both informal and occupational.

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1 Some early studies focused on developed countries found that an increase in the MW did not produce adverse effects on employment (Gramlich, Flanagan, & Wachter, 1976; Card & Krueger, 1994; Dickens et al., 1994; Stewart, 2004) while other studies found that an increase in the MW reduced employment of less skilled workers (Neumark & Wascher, 2007; Addison & Ozturk, 2012; Dickens et al., 2012). Neumark (2017) summarized US studies highlighting on the conflicting evidence about labour effects of minimum wages.
pied largely by women: 14.3% of employed women in Latin American countries are domestic workers, 93% out of the domestic workers are female; of these, only 22.5% have social security coverage (Lexartza, Chavez & Carcedo, 2016). In a context with prevalent gender disparities in both wages and work opportunities (Gasparini & Marchioni, 2015), the domestic work is therefore a crucial sector for interventions aimed at reducing gender gaps in labor and for efforts to understand the impact of MW regulations on the informal sector.

To analyze how the MW regulation impacts the labor market outcomes of women employed in the domestic-work sector, we applied a dual-economy, density-discontinuity research design proposed by Jales (2017). Unlike most of the literature that evaluates the effects of MW by analyzing the marginal distribution of wages, this framework proposes modeling the joint distribution of wages and sectors. That allows to identify the typical compliance, non-compliance and non-employment effects of MW, and crucially, also to estimate the magnitude of mobility between formal and informal sector by using cross-sectional data. The identification strategy mostly relies on the discontinuity around the MW in the observed distribution. We use cross-sectional data from the nationally representative National Household Survey (NHS) performed by the National Institute of Statistics in Uruguay from 2006 to 2016. It is the main survey to provide information regarding employment status and wages.

Results show that the MW have had significant effects over domestic female workers in Uruguay. Nearly 20% of women increased their wages and reached the MW over the analysis period, and this is experienced for formal workers but also for informal workers not covered by the wage policy, which is in line with the “lighthouse” hypothesis —i.e., the minimum wage acts as a signal for wage bargaining, even in unregulated sectors of the labor market— (Maloney & Mendez, 2004). On the other hand, on average 65.4% of affected women were non-compliers and did not receive the MW, figure that is similar for formal and informal workers over the period. As undesired effects of the policy, we found negative effects over formal employment and total employment in the domestic sector. For the whole period, 15.4% of affected workers became non-employed in the domestic sector, and 64.3% of formal domestic workers migrated to the informal sector. The observed patterns in non-employment (sector mobility) increased (decreased) over time. Nevertheless, secondary data suggest that these undesired effects were likely to be offset by other labor policies as well as by sustained economic growth and improved conditions in the labor market. Finally, heterogeneous effect analysis evidenced deep differences in MW impacts among geographical region, age and presence of children in the household. In the capital city, Montevideo, the sector mobility effect was lower, maybe due to greater enforcement and labor inspections. In contrast, younger domestic workers showed higher mobility across formal and informal sectors, which could be explained due to myopia on the future benefits associated with formalization as well as less bargaining power of younger workers.

Our paper contributes with two strands of the MW literature. First, this research is related with a series of empirical studies that explore the effect of the MW in developing countries with large informal sectors. In particular, for Latin American countries those studies have found mixed effects on employment, formal employment, and wages (Groisman et al., 2015). Previous studies usually found positive effects on wages, showing an increase in the average wages (Gindling & Terrell, 2009) of both formal and informal workers (Boeri, Garibaldi, & Ribeiro, 2011; Khamis, 2013; Jales, 2017), an increase in the wages of low-income workers (Neumark, Cunningham, & Siga, 2006); and a decrease in the wage gap within Lemos (2009) and between formal and informal sectors (Gindling & Terrell, 2005). Nevertheless, most of the studies documented negative effects of MW over employment (Wellington, 1991; Maloney & Mendez, 2004; Neumark et al., 2006; Gindling & Terrell, 2007; Gindling & Terrell, 2009; Addison & Ozturk, 2012; Jales, 2017). A crucial limitation of most of the previous studies is they did not have incorporated the dynamics between the formal and informal sector into the analysis of MW effects (some exceptions are: Fajnzylber, 2001; Maloney & Mendez, 2004; Gindling & Terrell, 2007; Gindling & Terrell, 2009; Lemos, 2009; Alaniz, Gindling, & Terrell, 2011). The common justification for the absence of such analysis, is the availability of data in developing countries mostly bases on cross-sectional datasets. Our paper overcome that limitation by applying a novel identification strategy that requires only cross-sectional data to capture formal-informal sector mobility. Indeed, we find strong MW effects over sector mobility which would have been hidden with other empirical approaches.

Second, this paper contributes to the bulk of research on gender and wage policies by focusing on a highly feminized sector, the domestic-work sector. The gender aspect of MW policies is relevant since women are more likely to benefit from decent wage floors, as they are over-represented in low-skilled/low-wage occupations, which are the most affected by this type of labor regulation (Neumark et al., 2006; Grimshaw & Ruberyi, 2011). Therefore, minimum wage policies can contribute to narrowing the gender pay gap (Gasparini & Tornaroli, 2009; Gasparini & Marchioni, 2015). Indeed, Schafer and Gottschal (2015) found suggestive evidence that countries with a higher MW have lower gender pay gaps. However, direct and credible evidence on the impact of the MW on low-wage female workers is still scarce. An exception are Dinkelman and Ranchhod (2012) and Gudihande and Jacob (2020). The first in South Africa and the latter in India, both analyze the introduction of a MW in the domestic-work sector and find strong wage increase with almost no effect on employment. However, a limitation of these studies is they are not able to show the extent to which the zero employment effect is associated with a nonexistent unemployment impact of the MW or to movements from formal to informal jobs that would mitigate the unemployment channel. Indeed, our findings suggest that both unemployment and migration from formal to informal sector—jointly with a sufficiently high informal sector to absorb such movements—are key drivers to explain the total effect of MW on employment.

In the following section, we revise the theoretical literature on MW and the impacts on labor markets. Next, we present the empirical setting, deepening the source of information and the construction of the sample. Then, we present the analytical model and the empirical approach we use to identify the MW impacts on the domestic-work sector. Following, we show the empirical results and finalize by concluding and discussing some policy implications of our findings.

2. Theoretical considerations

The neoclassical model, based on competitive markets, predicts that the introduction of a MW will generate compression on wage distribution but have negative effects on employment. Since the 1990s, however, this result has been placed in doubt by a vast empirical literature whose authors report null or even positive effects of the MW on employment as well as by new theories that predict increases in wages without a consequent reduction in employment (Holmlund, 2014). But the findings reported in that literature and the more recent theoretical approaches are all based on imperfect competition: models that allow firms to have some market power to set wages (Lustig & Mcleod, 1995).

Studies focused on developing countries have considered the existence of dual labor markets (i.e., with formal and informal sectors) for which MW legislation was not binding (Maloney &
Mincer (1976), for example, argued that the perfect mobility between sectors and if wages are flexible between sectors would increase. This mechanism works only if total employment would not be affected and wage inequality would increase. In such a model, displaced from the formal sector will move to the informal one. Mendez, 2004; Gindling & Terrell, 2005; Gindling & Terrell, 2007; Gindling & Terrell, 2009; Lemos, 2009. The standard two-sector competitive model predicts that, following a MW hike, workers are displaced from the formal sector will move to the informal one. 3 The sample for this paper included women between 18 and 69 who reported being employed in domestic work and who were not retired from other sectors. Pooling all survey data yielded a sample of 44,326 women domestic workers for the 2006–2016 period. This final sample represented 18.4% of all women employed in the analyzed period (see Table 1). All estimations were computed using survey weights calculated by National Institute of Statistics and calibrated to estimate the population according to projections. In addition, as supplementary data, we used information from the Social Security Institute (SSI) on labor inspections to analyze enforcement of the policy. This information consisted of data from 2007–2015 on the number of workplace inspections carried out in the domestic-work sector and in the total labor market.

Gindling & Terrell, 2009; Lemos, 2009). The standard two-sector competitive model predicts that, following a MW hike, workers displaced from the formal sector will move to the informal one. Hence, employment in the informal sector increases and wages fall, while the opposite occurs in the formal sector. In such a model, total employment would not be affected and wage inequality between sectors would increase. This mechanism works only if there is perfect mobility between sectors and if wages are flexible in the informal sector. Mincer (1976), for example, argued that the effects of the MW depend upon both the direction of the flow of workers and whether workers can move from the informal to the formal sector (for example, to seek better-paid jobs, even assuming the possibility of periods of unemployment). Thus, the final effect of the MW depends upon the size and elasticity of the labor supply and upon demand in the formal and informal sectors, allowing wages to rise in the informal sector if employment in that sector falls sufficiently.

Other studies that find evidence of wage increases in the informal sector in developing countries explain these results with the theory of the lighthouse effect. In this model, the MW, despite operating in the formal sector, becomes a reference price for negotiation in the informal sector as well. If firms in the informal sector have any monopsony power, the implementation of MW in the formal sector will also increase wages in the informal one (Souza & Baltar, 1980; cited in Boeri et al., 2011). In this line, Basu, Chau, and Kanbur, 2015 based in a model of contractual dualism argue that in developing countries although wages in the formal sector are higher than those in the informal sector given the skill level and the national wage distribution has a spike in the MW, there are actually some wages in the informal sector that are above the MW. Another justification for the increase in informal wages is shadow-employment and sorting mechanisms according to which workers seek employment in the shadow sector (not covered by the MW) or in the legal sector (covered by the MW). The meeting of workers and workers is regulated by a sorting mechanism with different transition functions between sectors; in the absence of a MW, then, low-skilled workers are concentrated in the shadow sector. The introduction of a MW changes the sorting mechanism, however the increase in the skill level of the shadow sector also increases workers’ wages (Fajnzylber, 2001; Boeri et al., 2011).

There is another theoretical model presented by Basu, Chau, and Kanbur, 2009 that introduce the enforcement as a key element in the analysis of MW effects. The authors highlight that the empirical findings from developing countries labour markets are consistent with settings of imperfect competition, imperfect enforcement, and imperfect Government commitment. Therefore, the employment effects of the MW legislation would not serve to test the competitiveness of the labor market if there is imperfect enforcement.

In Latin American countries it is difficult to build a theoretical model to predict the redistributive/wage effects of the MW on different groups of workers (Gindling & Terrell, 2009) because those effects also depend upon the specific conditions of the labor market (wages and sector mobility, e.g.) and the specific characteristics of MW policy (for example, coverage and size of the increase). As Holmlund (2014) pointed out, economic research on the effects of a MW on labor relied more on empirical studies than on the development of theoretical models.

3.2. Variables of interest

The main outcomes under analysis were wages, non-employment, and formal-informal sector mobility. Wages were measured as hourly income from labor in the domestic worker’s primary job. The non-employment effect quantified the reduction in employment in the domestic-work sector as a consequence of MW policy. Following Amarante and Espino (2008) and Gasparini and Tornarolli (2009), we defined formal employment on the basis of whether a worker contributed to social security in her or his primary job. It is common in Latin America to capture informal employment from a “legalistic” or “social protection” perspective, and we use the terms “formal/informal worker” and “formal/informal sector” interchangeably: both refer to the worker’s situation with respect to social-security coverage.

As mentioned, the survey contains information about all income sources, including a wide set of questions regarding monetary and non-monetary labor income, for the primary and secondary job. The NHS also captures hours of work in primary and secondary job through the question “How many hours do you usually work in a week?” which allows us to create hourly wage measures. It also provides information regarding contributions to social security in primary and secondary job through the question “Do you contribute to a retirement fund for this work?”. Following Amarante and Espino (2008) we will use this question to define formality and informality, since it has proven to be the most relevant to analyse the quality of work. The fundamental variables for the analysis included in the survey are, workers characteristics (sex, age, years of education, ethnicity, geographic region) and job characteristics (hours, wage, informal-formal sector).

2 Microdata and all related documents are available here: http://www.ine.gub.uy/web/guest/encuesta-continua-de-hogares1.

3 This implies people whose work fell into the International Standard Industrial Classification of All Economic Activities (ISIC) category of “Activities of Households as Employers of Domestic Personnel” and who worked in one of the following occupations, as defined by the International Standard Classification of Occupations (ISCO) system: Child Care Workers (5311), Home-Based Personal Care Workers (5322), Companions and Valets (5162), and Domestic Cleaners and Helpers (9111). Live-in domestic workers were excluded.

3. Empirical setting: data and background

3.1. Data source and sample construction

Our empirical analysis was based on cross-sectional data from the nationally representative National Household Survey (NHS) performed by the National Institute of Statistics in Uruguay covering 2006–2016. The survey provides information at household and individual level, and is representative of the entire population. The NHS from 2006 to 2016 can be analysed as repeated cross sections, given their comparability and representativeness in terms of survey design.

The main objective of this survey is to provide information about employment, unemployment, underemployment, hours of work, income, duration of unemployment, industry, occupation, status in employment and level of education. The sampling is stratified with optimal allocation for household per capita income and unemployment rate, which increases precision of income estimators. The sample for this paper included women between 18 and 69 who reported being employed in domestic work and who were not retired from other sectors. Pooling all survey data yielded a sample of 44,326 women domestic workers for the 2006–2016 period. This final sample represented 18.4% of all women employed in the analyzed period (see Table 1). All estimations were computed using survey weights calculated by National Institute of Statistics and calibrated to estimate the population according to projections.

In addition, as supplementary data, we used information from the Social Security Institute (SSI) on labor inspections to analyze enforcement of the policy. This information consisted of data from 2007–2015 on the number of workplace inspections carried out in the domestic-work sector and in the total labor market.

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3.3. The labor market and the domestic sector in Uruguay

Uruguay stands out in Latin America for its economic and social performance during the last decade. Between 2006 and 2016 average growth in GDP was 4.7%, and labor indicators improved substantially. Fig. 1 shows labor market indicators for women in Uruguay between 2006 and 2016, particularly, unemployment, labor force participation, employment, labor informality and the proportion of women employed in the domestic sector. It can be seen that the labor-force participation and employment of women increased steadily; in the same period, the unemployment rate decreased until 2011 and then increased slightly, reaching levels below 10% in 2016. Informal employment in the labor force continued to show a substantial decrease across the entire period.

Nevertheless, the integration of women into the labor market was characterized by strong occupational segregation, and women have largely entered occupations with unfavorable conditions vis-à-vis wages, hours, and informal employment. Occupational segregation made up 45.6% for domestic workers. These patterns are similar to those observed in other developing countries. For Latin America countries, 93% of the people employed in domestic work in 2013 were women, and 77.5% were informal (Lexartza et al., 2016). In South Africa, these figures were 80% and 62% in 2004 (Dinkelman & Ranchod, 2012).

Labor informality is 40% on average in Latin American countries; it is lowest in Uruguay and Chile (Gasparini & Tornaroli, 2012). Nevertheless, the integration of women into the labor market was characterized by strong occupational segregation, and women have largely entered occupations with unfavorable conditions vis-à-vis wages, hours, and informal employment. Occupational segregation made up 45.6% for domestic workers. These patterns are similar to those observed in other developing countries. For Latin America countries, 93% of the people employed in domestic work in 2013 were women, and 77.5% were informal (Lexartza et al., 2016). In South Africa, these figures were 80% and 62% in 2004 (Dinkelman & Ranchod, 2012).

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tion of the Uruguayan social-protection system, while the benefits of social security are closely linked to the formal labor market. There are two main wage policies in Uruguay: the National Minimum Wage (NMW), in effect since 1969, and collective bargaining among workers, employers, and the government, which has been in place since 1943. These policies apply to formal workers who cannot bargain, but domestic workers were excluded from both until 2005. Despite early MW regulation in Uruguay (as in several Latin American countries), MW policies were not effective in determining the marginal distribution of wages at the MW point. Jales (2017) developed an extension for the case of a developing country with a large informal sector by analyzing the joint distribution of wages and sectors. Basically, this framework models the joint distribution of wages and sectors both for observed and latent distribution. Empirically, this is implemented by combining a non-parametric density-discontinuity design with a parametric model for the conditional probability of the sector given the wage.

We used $S_i$ to indicate the sector to which worker $i$ belonged, which took the value 1 if the worker belonged to the formal sector and 0 if the worker belonged to the informal one. We let $W_i$ represent the wage of worker $i$. Additionally, we defined pair $S_i$ and $W_i(W(1), S(1))$ to indicate the setting for the joint observed wages and sector distribution, while $(W(0), S(0))$ identified latent wages and sectors. The latter is the counterfactual or distribution in the absence of a MW policy. Finally, we used $F_0(w|f_0(w))$ to serve as the CDF (pdf) of $W(0)$ (latent wages) and $F(w|f(w))$ as the CDF (pdf) of $W(1)$ (observed wages).

Following Jales (2017), we made a series of assumptions in estimating the model (see Section 5.1). Once these assumptions were made, we were able to complete the model for the effects of a MW by defining these conditions: If the latent wage was lower than the MW in the domestic-work sector ($m$) and if the worker was formal in the latent distribution, the worker would maintain the same wage and migrate to the informal sector with probability $p^*_m$; would increase her wage to the minimum and remain in the formal sector with probability $p^*_m^0$, and would become unemployed or employed in another sector in probability $p^*_m$.

$$
\text{if } W(0) < m \text{ and } S(0) = 1 \rightarrow (W(1), S(1)) = \\
(W(0), 0) \text{ with probability } p^*_d^1 \\
(m, 1) \text{ with probability } p^*_m^1 \\
(...) \text{ with probability } p^*_m^0
$$

Additionally, if the latent wage was lower than the MW and the worker was informal in the latent distribution, she would maintain the same wage and remain in the informal sector in probability $p^*_m$.

$$
\text{if } W(0) < m \text{ and } S(0) = 0 \rightarrow (W(1), S(1)) = \\
(W(0), 0) \text{ with probability } p^*_d^0 \\
(m, 0) \text{ with probability } p^*_m^0
$$

Given this theoretical model, the objective was to estimate the parameters $(p^*_d^0, p^*_d^1, p^*_m^0, p^*_m^1, p^*_d, p^*_m)$ and the joint distribution of latent sectors and wages. Below, we present the economic interpretation of each parameter, considering that in all cases they refer to workers with latent wages lower than the MW:

**Probability of non-compliance for formal domestic workers (p^*_d^1):** shift of workers from the formal to the informal sector. That is, the proportion of formal domestic workers who maintained a wage below the minimum and therefore migrated to the informal sector.

4. **Analytical model: dual-economy density-discontinuity approach**

We applied the dual-economy density-discontinuity design developed by Jales (2017) to estimate the impact of the MW in the domestic-work sector on wages, employment, and formal-informal sector mobility for women in Uruguay. The model is based on Doyle (2006), who analyzed the effects of the MW on wages and employment by exploiting the discontinuity in the marginal distribution of wages at the MW point. Jales (2017) developed an extension for the case of a developing country with a large informal sector by analyzing the joint distribution of wages and sectors. Basically, this framework models the joint distribution of wages and sectors both for observed and latent distribution. Empirically, this is implemented by combining a non-parametric density-discontinuity design with a parametric model for the conditional probability of the sector given the wage.

Fig. 1. Labor-Market Indicators for Women, Uruguay. (Notes: The proportion of women looking for a job but not employed ("Labor Informality") and the proportion of women employed in the domestic-work sector ("Domestic Sector"). The dataset was taken from the 2006–2016 NHS. Results may not correspond to Fig. 4 because this sample included all men and women older than 14.)
Probability of compliance for formal domestic workers ($\pi_{FM}^{m}$): effect on the wages of formal workers or the proportion of formal domestic workers whose salaries increased to meet the MW regulation.

Probability of non-employment for formal domestic workers ($\pi_{FM}^{u}$): effect on employment in the domestic-work sector. Because this study was based on a single economic sector, the parameter that quantified the unemployment effect in the original model quantifies, in this case, the decrease in employment of the domestic sector without discerning whether it was unemployment or the movement of workers to another sector. If some domestic workers who lost their jobs moved to other occupations in the formal sector, our estimate of the positive non-employment effect (i.e., negative employment shock) of a higher minimum wage would be over-estimated. Indeed, the evidence we present in Section 6.2 suggests that this type of movement in the formal labor market did, in fact, occur in our setting. Thereby, the estimates of $\pi_{FM}^{u}$ should be considered as an upper bound for the effect of the MW on the probability of non-employment for formal domestic workers.

Probability of non-compliance for informal domestic workers ($\pi_{IM}^{u}$): proportion of informal domestic workers who maintained the same pre-policy wage (below the minimum).

Probability of compliance for informal domestic workers ($\pi_{IM}^{m}$): proportion of domestic workers who increased their salaries to match the MW but remained in the informal sector.

Finally, it is worth emphasizing that, while the model accommodates different expected effects in the labor market in response to the MW policy, it does not take into account two possible effects of workers moving from the informal to the formal sector. First, workers in the informal sector might quit their jobs to seek better-paid employment in the formal sector after the MW policy, which should increase the probability of a worker migrating from the informal to the formal sector. Second, to look for a job in the formal sector, individuals might have to assume a period of unemployment. Thus, the probability that a worker who was in the informal sector is subsequently unemployed after implementation of the MW policy should also increase.

5. Empirical approach and descriptive evidence

5.1. Assumptions, identification and estimation

Following Jales (2017), we made a series of assumptions regarding the behavior of the domestic-work sector, some of which are tested in the next section: (1) for the methodology to be applied, discontinuity around $m$ must exist in the observed wage distribution; (2) the density of latent wages and their first derivative existed, was non-zero, and was continuous at $m$; (3) the conditional probability of the latent sector given latent wages could be described by a parametric model; (4) no spillovers were allowed: that is, both wages and the sector of workers with latent wages above the MW were not affected by the policy; (5) probabilities were the same for all workers and should be interpreted as an average of the mass of affected workers; (6) the probabilities did not depend upon workers’ latent wage; (7) the wages of informal workers below the MW were not affected by the possible inflow of formal workers; (8) the monitoring of the compliance with MW law is not an increasing function of the MW. Finally, to apply this methodology to the case of a single employment sector, it was necessary to assume (9) that there was no migration of workers from other sectors to the domestic-work sector after the introduction of the MW.

This would have invalidated the strategy because the density of wages would not have been integrated to one.\(^9\)

Identification and proper estimation of the parameters of interest ($\pi_{FM}^{u}, \pi_{FM}^{m}, \pi_{IM}^{u}, \pi_{IM}^{m}$) rests on the validity of these assumptions. We present the estimation procedure in Appendix 1. It is important to mention that the main challenge in estimating the effects of the MW in Uruguay under Jales’ methodology is that our study included no workers who earned exactly the minimum wage. As a result, we defined the MW fraction as those workers whose average hourly wage fell within 0.05 standard deviations above or below the MW.\(^{10}\)

5.2. Testing assumptions

Regarding Assumption 1 in Table A.1, we provide evidence that validates the hypothesis of discontinuity on observed wages near the MW level. Following McCrary (2008), we analyzed the continuity of wages near the MW with a local linear density estimator. To validate the continuity of latent wages (Assumption 2), in line with Jales (2017), we performed a placebo test at different points of the wage distribution above the MW level (Table A.2). The null hypothesis of no discontinuity was rejected for some years but to a lesser extent than in the real test. Appendix 3 shows evidence that validates Assumption 3 regarding independence between sector and wages: Fig. A.2 shows evidence in graph form that the formality rate does not vary significantly above the MW level. Table A.4 shows the results of a linear regression of formal employment on wages for domestic workers above the MW level and demonstrates both that the coefficient tended to decrease once we conditioned the sample on higher wages and that the level of significance fell. Assumption 5 is intended to simplify the analysis but was not critical to our methodology. Section 6.3 shows evidence that supports Assumption 8. Despite the fact that inspections in the domestic sector were verified for the first time in 2007 coinciding with the implementation of the MW, then they decreased throughout the analyzed period not consistent with the sustained increase in MW. Assumption 9 of no migration seems reasonable based on Fig. 1, which shows a decrease in employment in the domestic-work sector, as does the existence since 1969 of a NMW which is similar to the pay received by domestics.\(^{11}\) This allowed us to confirm that migration between sectors was not expected.

5.3. Descriptive evidence

Table 1 compares the personal (age, years of education, presence of children under 18, afro-ascendance, region of residence and household income) and labor characteristics (hourly wage, tenure, informal sector and proportion of workers below the MW) of all employed women to those of women employed in domestic work. The latter tended to be older, less educated, and more Afro-descendant, and they were more likely to come from households in which children under 18 were present and whose income fell into the lowest 40%. They were also less concentrated in the capital city. Domestic workers were characterized by fewer years of experience and a higher levels of informality, and their hourly wages were lower. In fact, the percentage of domestic workers below the MW was consistently higher.\(^{12}\) Domestic workers in

\(^9\) As will be shown in the next section, Assumptions 3 and 4 are critical for the identification strategy.

\(^{10}\) Models estimated with groups defined by different measurements above and below the standard deviation produced similar results (Table A.8, Appendix 6.)

\(^{11}\) For the period under analysis, the hourly MW was an average of 15% higher for the domestic sector in relation to the NMW.

\(^{12}\) As shown, the characteristics of domestic workers may limit the external validity of this study.
workers (sector mobility) (pformal domestic workers increased to meet the MW threshold had a significant effect on wages in the formal sector as the proportion of workers affected by the policy. Additionally, informal workers were characterized by lower tenure and lower hourly wages. The percentage of informal domestic workers below the MW was consistently higher, and workers below the MW belonged mostly to the informal sector.

Fig. 2 plots the evolution of hourly MW for domestic workers, the observed hourly net wages and the percentage or workers below the MW. There is a considerable increase in the 10th percentile of domestic workers’ observed wages the one with the largest growth. While the 90th percentile increased by 45%, the 10th percentile increased almost double that percentage, supporting the hypothesis that changes in wage regulation may have affected workers with the lowest earnings in particular, reducing wage inequality in the sector. The MW has increased 160% since 2006. Combining both analyses, we observed an increase of 26% in workers below the MW, which can be explained by a greater increase in the MW in comparison to wages.

Finally, we present the histogram of wages for formal and informal workers normalized to the MW level (Fig. 3). Despite the fact that the discontinuities are not as marked as they are in the theoretical model, we observe a discontinuous increase in the MW level for formal workers and a spike in the MW level for informal workers. Consistent with the data presented in Table 1, the proportion of workers earning below the MW was higher in the informal sector.

6. Labor-market responses to the minimum wage

In this section the main results are presented. Table 2 reports all model parameter estimates for the pooled data, the mass of affected workers (\(F_\text{d}(m)\)), the probability of compliance for the whole domestic work sector (\(\pi_m\)), the probability of non-compliance for the whole sector (\(\pi_d\)), the probability of non-employment for the whole sector (\(\pi_u\)), the latent size of the formal sector (\(\Lambda\)), the probability of non-compliance for formal domestic workers (sector mobility) (\(\pi_1\)), the probability of compliance for formal domestic workers (\(\pi_2\)), the probability of non-compliance for informal domestic workers (\(\pi_3\)) and the probability of compliance for informal domestic workers (\(\pi_4\)). One can observe the significant effects of the MW on wages, employment, and mobility in the domestic-work sector. We note that the probability parameter referred to the mass of affected workers with latent wages below the MW (\(F_\text{d}(m)\)) accounted for 20.3% of women in domestic work who were affected by the policy.

The results show that the MW had a positive and a statistically significant effect on wages in the formal sector as the proportion of formal domestic workers increased to meet the MW threshold (6.3%-\(\pi_1\)). Moreover, the MW policy also led to an increase in wages in the informal sector not covered by the wage regulation (33.5%-\(\pi_4\)). This indicates that workers in the informal sector had substantial bargaining power. Taken together, the results show that MW had a positive and statistically significant effect on the proportion of women in the domestic sector that meet with wage policy (19.3%-\(\pi_u\)). Nevertheless, results also show a drop in employment in the domestic sector (\(\pi_u\)), explained by the decrease in employment in the formal sector as well as increased mobility between sectors, which negatively affected formality (\(\pi_3\)).

6.1. Compliance responses

Overall, we found that 65.4% of affected women non-complied with the wage policy (\(\pi_d\)) and did not receive the minimum wage after the labor policy went into effect. These results are consistent with the poor conditions that existed in the domestic-work sector in Uruguay in 2006 (in terms of wages and informal employment). The non-compliance effect was similar for formal (64.3%-\(\pi_1\)) and informal workers (66.5%-\(\pi_3\)). These parameters were much higher than those reported by Jales (2017).

On the other hand, the proportion of affected workers whose wages increased to reach the MW (\(\pi_m\)) was 19.3% for the whole period. This result was to be expected because the proportion of workers affected by the policy (\(F_\text{d}(m)\))—those below the MW in the counterfactual distribution—was greater than the observed proportion of workers below the MW (Table 1). The greater probability of earning the MW held true for formal domestic workers (6.3%-\(\pi_1\)) but also for informal workers not covered by the wage policy (33.5%-\(\pi_4\)). This result is in line with the lighthouse hypothesis that the introduction of a MW in the formal sector acts as a wage-setting signal in the informal sector, increasing the wages of informal workers (Maloney & Mendez, 2004; Gindling & Terrell, 2009; Lemos, 2009; Boeri et al., 2011).

6.2. Non-employment effects

We found a significant impact on the probability of non-employment in the domestic sector (\(\pi_u\)) which reached 15.4% for the pooled data. This effect is explained by an increase in the non-employment of formal domestic workers (29.4%-\(\pi_1\)).

To calculate a comparable parameter of employment effect with previous literature, we estimated a naïve implied employment elasticity in the domestic-work sector with respect to the MW. A linear regression of non-employment effects in the domestic sector on the logarithm of hourly MW resulted in a significant elasticity of 0.3. This effect was lower than that found for developed countries (between 0.4 to 1.6) but was similar to the effect for low-skilled workers in Latin American countries (between 0.15 and 0.33) (Maloney & Mendez, 2004). Considering average MW increases for the period (10%), we found that employment in the domestic sector decreased approximately 3% because of the introduction of a MW. While the non-employment effect was quite high, it
returned to reasonable values when applied to aggregate domestic employment. Although the non-employment effect was much higher compared to the findings of Jales (2017), both the elasticity and the percentage drop in domestic work were quite similar.

An important limitation of the estimation of the non-employment parameter is that it conflates two different effects of the MW on formal employment of domestic workers: an increase in unemployment and increased movements to other occupations within the formal sector. While estimating these effects separately is relevant for guiding policy and interpretation, the model we applied to our setting is not well suited to account for these differences.

Instead, to explore whether this non-employment effect was the result of unemployment or of the shift of workers to other occupations, we presented suggestive evidence that exploits the patterns of change in the cross-sectional data. Fig. 4 shows that percentage of women employed as domestic workers decreased over the period of analysis, which is consistent with the non-employment effect we estimate (solid line). However, this pattern is not attributable to a decline in the number of women employed in the domestic sector, which actually remained almost constant over time (dash-dotted line). In contrast, as we showed in Fig. 1, the proportion of women who were employed increased during the period of analysis (while the unemployment rate declined). These patterns make it, unlikely that, the increased of unemployment of domestic workers is a consequence of the MW policy. An alternative explanation is that, in a context of economic growth and improved labor-market conditions such as Uruguay faced during the period of analysis, low-skilled women who entered the labor market (or were employed as domestic workers) might have chosen (moved to) other low-skilled occupations rather than the domestic sector. Indeed, Fig. 4 shows that the number of women employed in low-skilled jobs increased, as did their proportion of the total number of employed women, excluding the domestic-work sector.13

In all, although only suggestive, the descriptive data provide evidence consistent with the hypothesis that the non-employment effect resulted from the movement of workers to

---

**Table 2**

Model Parameter Estimates, Pooled Data.

<table>
<thead>
<tr>
<th>$F_0(m)$</th>
<th>$\pi_m$</th>
<th>$\pi_d$</th>
<th>$\Lambda$</th>
<th>$\pi_{1m}$</th>
<th>$\pi_{1d}$</th>
<th>$\pi_{0m}$</th>
<th>$\pi_{0d}$</th>
<th>Obs.</th>
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<td>0.154***</td>
<td>0.523***</td>
<td>0.063***</td>
<td>0.643***</td>
<td>0.335***</td>
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</tr>
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<td>(0.008)</td>
<td>(0.022)</td>
<td>(0.008)</td>
<td>(0.005)</td>
<td>(0.051)</td>
<td>(0.015)</td>
<td>(0.015)</td>
<td></td>
</tr>
</tbody>
</table>

Notes: The sample included women between 18 and 69 who were employed in the domestic sector and not retired. The table shows the mass of affected workers ($F_0(m)$), the probability of compliance for the whole sector ($\pi_m$), the probability of non-compliance for the whole sector ($\pi_d$), the probability of non-employment for the whole sector ($\pi_u$), the latent size of the formal sector ($\Lambda$), the probability of non-compliance for formal domestic workers (sector mobility) ($\pi_{1d}$), the probability of compliance for formal domestic workers ($\pi_{1m}$), the probability of non-compliance for informal domestic workers ($\pi_{0d}$) and the probability of compliance for informal domestic workers ($\pi_{0m}$). Standard errors in parenthesis computed by 500 bootstrap replications. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Data were drawn from the 2006–2016 NHS.

---

**Fig. 3.** Histogram of Normalized Wages for Formal and Informal Workers, Pooled Data. (Notes: The sample included all women between 18 and 69 who were employed in the domestic sector and not retired. Because hourly wages were normalized, red lines indicate the MW level. The data were drawn from the 2006–2016 NHS.)

**Fig. 4.** Labor-Market Indicators for Women (Main Sample), 2006–2016. (Notes: The sample included all women between 18 and 69 who were employed in the domestic sector and not retired. The figure plots the proportion of women employed in the domestic sector (“Domestic”) and in low-skilled jobs excluding the domestic sector (“Low-Skilled Non Domestic”) in the lhs-axis, as well as the level of employment in the domestic sector (“Employment Domestic”) and employment in low-skilled jobs (“Employment Low-Skilled”) in the rhs-axis. Data were drawn from the 2006–2016 NHS.)

13 Low-skilled jobs are defined as those with code 5*** or 9*** in the International Standard Classification of Occupations (ISCO, 2008).
other (low-skilled) sectors rather than being an undesired effect of the MW on employment.

6.3. Sector mobility and enforcement

The proportion of formal workers among total workers affected by the policy (that is, the latent size of the formal sector \( \Lambda \)) was 52.3% for the pooled data, a lower percentage than Jales (2017) reported. As an undesired effect of the policy, we observed high sector mobility \( (\pi_d) \). 64.3% of formal domestic workers affected by the MW policy maintain the wage below the minimum and therefore migrate to the informal sector due to the wage policy. Sector mobility is much higher than reported by Jales (2017).

To establish a comparable parameter of the effect of MW on formal employment, we estimated an elasticity of formal employment with respect to the MW. A linear regression with formal employment in the domestic sector as the dependent variable and the logarithm of hourly MW as the independent variable resulted in a statistically significant elasticity of 0.28.

Nevertheless, in the period under review, the proportion of women who contributed to social security in general and in the domestic sector in Uruguay increased substantially. As a result, we analyzed whether high sector mobility due to MW policy contradicted the finding that formal employment increased. Fig. 5 presents the evolution of the probability of being employed in the formal domestic sector by wage level, above and below the MW, and shows that the probability of being formally employed for workers below the MW was small and did not change substantially. On the other hand, workers above the MW were more likely to be engaged in formal employment, and their formality rate increased substantially between 2006 and 2016, which explains the increase in the overall formality rate for domestic workers. Because the model estimates were based on the bottom of the wage distribution, these results were consistent with the evolution of formal employment observed in the domestic-work sector.

The relationship between workplace inspections in the domestic sector and those in all sectors remained stable during the period under analysis. Inspections were made in response to complaints or were initiated by the monitoring body, especially in cases in which the anonymity of the complainant was an issue. Although there was a substantial improvement in the handling of complaints, particularly because anonymity had not previously been fully respected, important complexities remained. It was not possible to enter a private home without a search warrant, so permission was requested to enter or to talk with the domestic worker. When noncompliance with any of the regulations was found and summonses were issued, the offending party would make payments of wages due as well as a fine, and be brought into compliance. If the conditions of compliance were not met within an established period, the summons would be renewed, and a new violation would be charged.

Formal employment increased overall, though that increase was considerably higher in the domestic sector. It is worth mentioning that there was no wage monitoring in the domestic sector until 2007, so the first years were key for improving working conditions but were not accompanied by a marked increase in formal employment. From 2011 onward, after years in which the policy was in effect and the learning period had been considerable, level of formal employment increased.

Fig. 5. Conditional Probability of Belonging to the Formal Sector 2006–2016, by Wage Level. (Notes: The sample included all women in the domestic-work sector who were between 18 and 69 and not retired. The figure plots the probability of being employed in the formal domestic sector \( P(S = 1) \) and the degree to which this probability was conditional on wage level that is, whether the worker earned above \( P(S = 1|W > MW) \) or below the minimum wage \( P(S = 1|W < MW) \). Data were drawn from the 2006–2016 NHI S.)

In this sense, minimum-wage policy by itself, if accompanied by policies such as workplace inspections and awareness campaigns, could affect formal employment, contributing to improved formal employment and working conditions (Almeida & Carneiro, 2012). Nevertheless, Ulyssia (2010) highlighted the fact that a substantial increase in enforcement could reduce the informal sector but have negative effects on employment. Conversely, policies that reduced costs in the formal sector did not involve a tradeoff between employment and informal employment.

6.4. Dynamic of minimum wage effects

In this section we analyze the dynamic of minimum wage effects, analyzing the evolution of all model parameters over the period of analysis. Fig. 6 and Table A.5 in Appendix 5 present results for the evolution of all parameter estimates over time. First, we observed an increase in the mass of affected workers \( (F_c(m)) \) from 16.6% in 2006 to 25.1% in 2016 (Panel a). This increase in the proportion of domestic workers with latent wages below the MW level is consistent with the evidence in Fig. 2 that the MW grew more strongly than observed wages over the period under discussion. It is additionally consistent with the fact that, since 2005, minimum wages continued to exercise a significant effect on the determination of wages (Marinakis & Bueno, 2014).

We also observed a significant decrease (from 32.7% to 12.6%) in the probability that domestic workers would earn the MW (Panel b; compliance \( \pi_a(m) \)). At the same time, figures show a drop in the probability of non-compliance \( \pi_n(m) \) from 64.0% to 54.7% (Panel c) although this difference was small and not statistically significant. Meanwhile, we observed significant increase in the probability of non-employment in the domestic sector \( \pi_d \) from 3.3% to 32.7% (Panel d). One hypothesis is that, during a period of economic growth and improvement in employment conditions, domestic workers might prefer to be unemployed or to be employed in another sector rather than continue to earn a wage below the MW. Such a choice could be particularly difficult for formal workers who would have found themselves faced with this choice: either shift to the informal sector (and lose all the benefits of social security) or migrate to another work sector. Sector mobility consistently decreased over the period under analysis, and the non-compliance parameter for formal domestic workers \( \pi_d(m) \)
dropped from 81.3% in 2006 to 44.5% in 2016 (Panel e). The net effect on the formal sector was positive, perhaps mainly in association with Uruguay’s economic growth and increased employment between 2006 and 2016. When economic conditions worsen, how-
ever, changes in policies may be needed to ensure that workers do not enter the informal sector.

Additionally, we observed an increase in the probability of non-compliance for informal domestic workers ($\pi^u_0$) from 52.8% to 73.3% (Panel f). An analysis of these estimates together with the latent size of the formal sector (\(\Lambda\)), which increased from 39.4% to 64.6% (Panel g), suggests that informal workers who remained in the informal sector after eleven years of broad labor policies could well be called the hard core of informal employment. With the increase in both the MW and the number of affected workers, those who remain below the MW have an ever more difficult time reaching the minimum, and the probability that their wages will remain below the MW is higher.

6.6. Robustness checks

Finally, it was important to analyze the sensitivity of our results to different specifications of the models or to methodological decisions. The first step was estimating the probability of non-compliance ($\pi_d$) for which we exploited the discontinuity around the MW level by estimating the ratio of the density of wages below and above the MW. Following Jales (2017), we performed the estimate using local linear density estimators with a bandwidth of eight times Silverman’s rule of thumb. We found practically no difference in the results of model parameter estimates for the pooled data (Table A.7). We did find differences in non-employment, the number of affected workers, and non-compliance of formal domestic workers with a bandwidth of four times Silverman’s rule of thumb.

Additionally, we estimated specifications of the models with different choices of the fraction at the minimum wage and different point estimations of the kernel density (Table A.8). The main result did not change with these variations. We only found significant differences for the parameters of compliance, non-compliance for informal workers, and compliance for informal workers for fractions at the minimum wage equal to 0.04 and 0.06 rather than 0.05.

Finally, we replicated the estimates by rounding wages at different heaping points (Table A.9), understanding that errors of measurement might have occurred in the monthly wages declared by workers (because, for example, of a tendency to report in round numbers). We found no significant differences in the results for the pooled data.

7. Conclusions and policy implications

Our results indicate significant effects of the MW on the mass of affected workers – latent wages below the minimum– affecting 20.3% of women in the domestic–work sector. Average results show a drop in employment in the domestic sector (15.4% of affected workers became non-employed in the sector), explained by the decrease in employment in the formal sector (29.4% of formal workers became non-employed). Although we cannot rule out the possibility that the non-employment effect is explained by an increase in unemployment, descriptive evidence suggests that it is attributable (at least in part) to domestic workers shifting to other occupations. The increased mobility of workers across occupations, however, would be mostly the result of a period of economic growth and improved working conditions that characterised Uruguay during the period of analysis, and not to the MW policy itself.

Simultaneously, an important negative effect on mobility between formal and informal sectors was observed: before the MW policy, 64.3% of affected formal domestic workers maintained a wage below the minimum and therefore migrated to the informal sector when the MW policy went into effect. The proportion of affected workers whose wages increased to reach the MW level was 19.3%, a shift that affected both formal domestic workers...
(6.3%) and informal workers not covered by the policy (33.5%). This is consistent with the lighthouse effect. Regarding sector mobility, we found that this non-desired effect seemed to be offset by the other labor policies in force during the period, including labor inspections and awareness campaigns.

Analyzing the evolution over time, we observed a significant decrease in the probability of earning the MW and an increase in the probability of non-employment between 2006 and 2016. One hypothesis is that, in the context of general economic growth and improvement in labor conditions, women in domestic work preferred to be unemployed or employed in other sectors rather than continue to earn below the MW in the domestic sector. Such a choice could be particularly difficult for those workers who would have found themselves faced with the choice of either migrating to another work sector or shifting to the informal sector (and losing all the benefits of social security). In fact, the probability of a shift to informal employment for formal workers (sector mobility) decreased substantially during the analyzed period.

The analysis of heterogeneous effects showed interesting results. Analyzing separately for women in households with or without children under 18 years old, we found higher non-employment effects for women in households without children. This could be due to a greater incentive to take the risk of being unemployed in order to look for better-paid work. We also found higher non-employment effects in workers in the capital city, possibly due to greater employment opportunities in other sectors with better working conditions. Our results were also significantly different if we considered age: there was high sector mobility for younger women, possibly the result of less bargaining power or lack of interest or myopia regarding on the future benefits of formalization and social security coverage.

In summary, this study provides evidence of the importance of minimum wages in establishing livable-wage floors for formal and informal domestic workers. We also found undesired effects of MW policy on employment and formal employment, however, which were likely to be offset by other labor policies, by sustained economic growth and by improvement of labor-market conditions. In this context, this study highlights the importance of applying broad labor policies that include both minimum wages and inspection of labor conditions to ensure the desired effects of the policy.

We expect these findings to contribute to better evidence-based policies in developing countries in which there are highly feminized sectors, high informality, and little regulation prior to the implementation of a MW wage policy.

CRediT authorship contribution statement

Sharon Katzkowicz: Conceptualization, Methodology, Software, Formal analysis, Data curation, Investigation, Writing - original draft. Gabriela Pedetti: Conceptualization, Methodology, Software, Formal analysis, Data curation, Investigation, Writing - original draft. Martina Querejeta: Conceptualization, Methodology, Software, Formal analysis, Data curation, Investigation, Writing - original draft. Marcelo Bérgolo: Conceptualization, Methodology, Investigation, Writing - original draft, Supervision.

Appendix A. Appendix

A.1. Estimation

Given the assumptions of the theoretical model, the relationship between the latent and observed unconditional wage distributions is given by:

$$f(w) = I(w < m) \frac{\pi_d(w) f_d(w)}{c} + \delta(w - m) \int^m \frac{\pi_m(w) f_o(w)}{c} dw + I(w > m) \frac{f_o(w)}{c}$$

Where c is a rescaling factor which accounts for the relationship between employment with and without the MW policy and allows the density to integrate to one:

$$c = 1 - \int^m \pi_o^L A(w) f_o(w) dw$$

For the formal sector, wage density is given by:

$$f(w|S(1) = 1) = I(w < m) \frac{\pi_d(w) f_d(w)I(w|S(0) = 1)}{c^1} + I(w > m) \frac{f_o(w)I(w|S(0) = 1)}{c^1}$$

While for the informal one it is:

$$f(w|S(1) = 0) = I(w < m) \frac{\pi_d(w) f_d(w)I(w|S(0) = 0)}{1 - A(w)^{c^0}} + I(w > m) \frac{f_o(w)I(w|S(0) = 0)}{1 - A(w)^{c^0}}$$

Where the specific factors c are:

$$c^1 = 1 - F_0(m|S(0) = 1)/(1 - \pi_d^1)$$ and $$c^0 = 1 + \pi_d^1 \int^m \frac{\Lambda(w)}{1 - \Lambda(w)} f_d(w)I(w|S(0) = 0) dw$$

The first step is estimating the probability of non-compliance for which we exploit the discontinuity around the MW as the ratio of the density of wages below and above the MW:

$$\pi_d = \lim_{m \to c} \frac{f(m - c) I(m)}{f(m + c)}$$

As we validated Assumption 3 of independence between sector and wages (Appendix 3), we estimated the density of wages at the MW by using local linear density estimators and, as suggested by Jales (2017) the plug-in method for the remaining parameters. Thus, the probability of compliance for formal workers was estimated as the probability of non-compliance weighted by the fraction at the MW in relation to the fraction below the MW:

$$\pi_m = \pi_d \frac{Pr[W(1) = m]}{Pr[W(1) < m]}$$

The total probability of non-employment in the domestic sector ($\pi_u$) was estimated by difference. The parameters for each sector depended upon the identification of the latent size of the formal sector. The main issue in the identification of the separate effects of the MW on the formal and informal sector, then, assumed that the conditional probability of the sector, given wages, was preserved once the MW was introduced. That allowed us to extrapolate the shape of the relationship above the MW for wages below. Thus, the non-employment probability for formal workers was estimated as $\pi_u$ re-scaled by the latent size of the formal sector ($\Lambda$):

$$\pi_u = \frac{1 - \pi_d - \pi_m}{\Lambda}$$

Then, the probability of compliance for formal domestic workers was estimated as:

$$\pi^1_m = \frac{Pr[W(1) = m | S(1) = 1]}{1 - Pr[W(1) = m | S(1) = 1]} \star \frac{1 - F_0(m)}{F_0(m)}$$

with $F_0(m)$ being the mass of affected workers or workers with latent wages below MW. For informal workers, the probability of compliance was estimated as the difference between the total prob-
ability of compliance and the probability for formal workers weighted by the latent size of the formal sector:

$$p_0^m = \frac{p_0^m}{C_0}$$

Finally, the non-compliance probabilities for informal and formal domestic workers were estimated by difference:

$$p_0^d = 1 - p_0^m$$

$$p_1^d = 1 - p_1^m - p_1^u$$

A.2. McCrary test of discontinuity

We conducted this test for every year and for total, formal, and informal workers separately, with wages normalized to the MW. Our main variable was the difference between net hourly wages and MW and the breakpoint analyzed was zero. The null hypothesis of no discontinuity was rejected at 10% confidence for the majority of years in the case of total workers, but not for formal and informal workers taken separately.

Fig. A.1. McCrary Graph Test of Wages of Domestic Workers around the Minimum Wage, 2006–2016. (Notes: The sample included all women between 18 and 69 who were employed in the domestic sector and not retired. Data were drawn from the 2006–2016 NHS.)

Table A.1

<table>
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<tr>
<th>Year</th>
<th>Total workers</th>
<th>Formal workers</th>
<th>Informal workers</th>
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<tr>
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<td>0.098</td>
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<td>0.094</td>
</tr>
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<td>2011</td>
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<tr>
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<td>0.094</td>
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<td>0.094</td>
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<tr>
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<tr>
<td>2016</td>
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</tr>
</tbody>
</table>

Notes: The sample included all women, 14 years or older, who were employed in the domestic sector. Data were drawn from the 2006–2016 NHS.
A.3. Independence test between sector and wages

Fig. A.2.

A.4. Data and descriptive analysis

Fig. A.3.

A.5. Estimation

Tables A.5 and A.6.

A.6. Robustness check for estimation

Tables A.7, A.8, A.9.

Table A.2
McCrary Test of Discontinuity on Wages for All Domestic Workers at Different Breakpoints, 2006–2016.

<table>
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<tr>
<th>Breakpoint (25)</th>
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</table>

Note: The sample included all women between 18 and 69 who were employed in the domestic sector and not retired. Data were drawn from the 2006–2016 NHS.

Table A.3
McCrary Test of Discontinuity in Wages for Total Domestic Workers Using Different Binsize.

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Note: The sample included all women between 18 and 69 who were employed in the domestic sector and not retired. The dataset corresponds to the pooled NHS from 2006 to 2016.

Table A.4
Parametric Linear Regression of Formality vs. Wages Logarithms.

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Note: The sample included all women between 18 and 69 who were employed in the domestic sector and not retired. Data were drawn from the 2006–2016 NHS.
Fig. A.3. Empirical Cumulative Distribution Function of Wages. (Notes: The sample included all women between 18 and 69 who were employed in the domestic sector and not retired. Data were drawn from the 2006–2016 NHS.)

Table A.5

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<td>0.159***</td>
<td>0.160***</td>
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<td>0.196***</td>
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<td>0.229***</td>
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<td>0.144***</td>
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<td>0.059***</td>
<td>0.054***</td>
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<td>0.067***</td>
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<td>(0.139)</td>
<td>(0.146)</td>
<td>(0.013)</td>
<td>(0.111)</td>
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<td>( p_{0m} )</td>
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<td>0.379***</td>
<td>0.252***</td>
<td>0.322***</td>
<td>0.332***</td>
<td>0.273***</td>
<td>0.279***</td>
<td>0.404***</td>
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<td>(0.037)</td>
<td>(0.042)</td>
<td>(0.041)</td>
<td>(0.045)</td>
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<td>(0.015)</td>
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<tr>
<td>( p_{0d} )</td>
<td>0.528***</td>
<td>0.624***</td>
<td>0.621***</td>
<td>0.748***</td>
<td>0.678***</td>
<td>0.668***</td>
<td>0.727***</td>
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<td>0.596***</td>
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Notes: The sample included women between 18 and 69 who were employed in the domestic sector and not retired. Standard errors in parentheses computed by 500 bootstrap replications. *** p < 0.01, ** p < 0.05, * p < 0.1. Data were drawn from the 2006–2016 NHS.
### Table A.6

#### Heterogeneity Analysis. Estimation of Parameters by Variables of Interest.

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<th>Years of education</th>
<th>Ethnicity</th>
<th>Capital city</th>
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<th>More than 35</th>
<th>No</th>
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Notes: The sample included all women between 18 and 69 who were employed in the domestic sector and not retired. Standard errors in parentheses computed by 500 bootstrap replications. *** p < 0.01, ** p < 0.05, * p < 0.1. Data were drawn from the 2006–2016 NHS.

### Table A.7

#### Different Choices of Bandwidth.

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</table>

Notes: The sample included all women between 18 and 69 who were employed in the domestic sector and not retired. Standard errors in parentheses computed by 500 bootstrap replications. *** p < 0.01, ** p < 0.05, * p < 0.1. In the table, the estimated parameters for pooled data using different choices of bandwidth are presented. Each column shows the times that Silverman's rule of thumb was applied. In the estimation of the model we considered eight times. Data were drawn from the 2006–2016 NHS.
that determines the point at which kernel density is calculated for the estimation of the non-compliance parameter. Data were drawn from the 2006–2016 NHS.

ÍDEM.


Cruces, G., Fields, G., Jaume, D., & Viollaz, M. (2017). In growth, employment, and

CIEDUR (2017). Mapa de género: Trabajo, empleo y negociación colectiva en


Gasparini, L. & Marchionni M. (Eds.)., Bridging gender gaps? The rise and deceleration of female labor force participation in Latin America. CASA UNLP.


Table A.8
Different MW STD Fractions and Kernel Density Point Estimation.

Table A.9
ÍDEM.

25

50

75

100

Obs.
44326
44326
44326
44326

Notes: The sample included all women between 18 and 69 who were employed in the domestic sector and not retired. Standard errors in parentheses computed by 500 bootstrap replications. *** p < 0.01, ** p < 0.05, * p < 0.1. is the factor that determines the window in which the fraction of workers who earn MW is defined. b is the factor that determines the point at which kernel density is calculated for the estimation of the non-compliance parameter. Data were drawn from the 2006–2016 NHS.

References


Khanis, M. (2013). Does the minimum wage have a higher impact on the informal than on the formal labor market? Evidence from quasi-experiments. Applied Economics, 45, 477–495.


