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Minimum wage effects. Evidence for domestic workers in Uruguay by using a density discontinuity approach

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Abstract

In this paper we estimate the impact of the minimum wage in the domestic work sector over wages, unemployment, and formal-informal sector mobility for women in Uruguay. To achieve the objective, we apply a dual-economy density discontinuity design developed by Jales (2017) using National Household Survey cross-sectional data from the period 2006 to 2016. We find significate effects of the MW over labour outcomes. Almost 20% of women increases their wages to reach the MW with little negative effects on employment in the domestic sector (3%). We also find undesired effects over formality, which seem to be offset by others labour policies implemented such as inspections and awareness campaigns. The main contribution of this paper is to generate new empirical evidence on minimum wage effects by using a recent and novel identification strategy with several advantages in the context of developing countries. Furthermore, this study contributes with the growing literature by focusing in a highly feminized and informalized sector. The findings will contribute to the improvement of labour policies based on evidence, both for the Uruguayan case and other Latin American countries.

JEL: J08, J16, J21, J31

Keywords: Minimum wage, labour market, gender, informal sector, Uruguay.

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1 Executive summary

MOTIVATION AND BACKGROUND:

The main purpose of the minimum wage (MW) legislation is to protect workers with lower wages by establishing a decent wage floor and so, MW can be seen as a redistributive policy aimed at overcoming poverty and reducing inequalities (Lemos, 2009; Marinakis & Bueno, 2014). Nevertheless, secondary effects of potentially negative results over employment have been documented in the literature and therefore, these policies could have mixed results on the aspects intended to improve initially (Neumark & Wascher, 2007). The empirical literature is wide in developed countries, however, new literature has recently emerged for developing countries. The heterogeneity in the design and enforcement of MW in Latin American countries and the high level of informal workers, which are in fact not covered by the policy, are the main challenges to generate credible empirical strategies on the effects of MW over employment and wages. Domestic work sector is highly feminized -11% of employed women in Latin America-, and has particularly high informality rates -73% of women in the domestic work sector does not have social security coverage-. In this context, domestic work sector is key for reducing labour gender gaps and contributing to the understanding of the impacts of MW regulations on the informal sector. Furthermore, Uruguay has positioned itself as a pioneer in the region with early implementation of labour policies in domestic work sector (ILO, 2016).

OBJECTIVE AND METHOD:

Using cross-sectional household surveys for the years 2006 to 2016, we estimate the impact of MW for domestic workers over wages, unemployment, and formal-informal sector mobility for women in Uruguay, based on a dual economy density discontinuity approach (Jales, 2017). The methodology exploits the discontinuity in wage density at the MW to estimate the effects of the introduction of a MW.

RESULTS:

- We found significate effects of the MW over wages, employment and sector mobility.
- Between women in domestic sector with latent wages below the minimum, 19.2% increases their wages to reach the MW, 15.3% became unemployed or employed in other work sector and 65.4% are non-compliers.
- Secondary evidence indicates that non-employment effect would be due to the shift of workers to other sectors and not to unemployment effect. However, this was possible due to the period of growth and improvement of working conditions and not to the MW policy itself.
- Informal domestic workers present higher compliance probability: 33.6% increase their salary to match the MW, although remaining in the informal sector. This is consistent with the lighthouse effect as long as the MW enforced in the formal sector also acts as a signal for wage setting in the informal sector.
- Formal workers present a higher non-compliance probability (64.5%). Based on administrative data we found this non-desire effect over formality seem to be offset by the others labour policies applied in the same period such as inspections and awareness campaigns.
- We observe a significant decrease in the probability of compliance and an increase in the probability of non-employment between 2006 and 2016. The probability of non-compliance for formal domestic workers – sector mobility- decreases substantially in the analysed period.
- Heterogeneous effect analysis evidences no significant differences by educational level or ethnicity. We found higher non-employment effects for women in households with children under 18 years old and for capital city workers. There is a high sector mobility for younger women.

POLICY IMPLICATIONS:

Minimum wage fixing in the domestic sector have had favourable results in the determination of decent wage floors but with undesired effects over formality. Results highlight the importance of applying broad labour

policies that include not only wage fixing but also the inspection of labour conditions and dissemination and awareness campaigns for the recognition of labour rights of domestic workers and mitigate the negative effect over formality. Furthermore, given the reasonable non-employment effect found in comparison with other developing countries, MW policies seems to be an interesting instrument towards reducing poverty and inequality.

CONTRIBUTION:

The main contribution of this paper is to generate new empirical evidence on minimum wage effects by using a recent and novel identification strategy with several advantages in the context of developing countries: a density discontinuity approach. This methodology is based on cross-sectional data, which is the most common type in Latin American countries, and allows to analyse MW effects separately for the formal and informal sector. This study contributes with the growing literature by focusing in a highly feminized and informalized work sector. In terms of policy design, the findings will contribute to generate evidence on the effects of the MW for the domestic work sector in Uruguay and, given Uruguay's pioneer role, the results will contribute towards the improvement of policies that promote formalization in other developing countries.

2 Introduction

The main purpose of the minimum wage (MW) legislation is to protect workers with lower wages by establishing a decent wage floor. Thus, MW can be seen as an important part of redistributive policies aimed at overcoming poverty and reducing inequalities (Lemos, 2009; Marinakis & Bueno, 2014). Nevertheless, secondary effects of new rigidities with potentially negative results over employment rates have been documented in the literature and therefore, these policies could have mixed results on the aspects intended to improve initially (Neumark & Wascher, 2007).

The empirical literature on the effects of the introduction of MW is wide in developed countries, however, new literature has recently emerged for developing countries (Dinkelman & Ranchhod, 2012; Lemos, 2009; Maloney & Núñez, 2004). The heterogeneity in the design and enforcement of MW in Latin American countries and the high level of informal workers[1], which are in fact not covered by the policy, are the main challenges to generate credible empirical strategies on the effects of MW over employment and wages. Labour formality is a key element in the analysis of employment, as it is crucial for access to other social rights such as health, safety against risks and income security in old age, among others (Filgueira, 2014). On average, the percentage of workers without social security coverage is about 40%[2], taking their minimum in Uruguay and Chile (Gasparini & Tornarolli, 2009). Thus, the main challenge for developing economies is to generate empirical strategies to analyse the effects of MW on employment and wage in both formal and informal sector (Gindling & Terrell, 2009 2007; Lemos, 2004; Maloney & Núñez, 2004; Fajnzylber, 2001).

In this paper we estimate the impact of the minimum wage in the domestic work sector over wages, unemployment, and formal-informal sector mobility for women in Uruguay. According to the Law 18.065,

[1] In this study we define formal workers regarding to the contributions to social security in primary job through the question "Do you contribute to a retirement fund for this work?" Therefore, following Amarante & Espino (2007) we define as informal workers those who are not covered by social security, since it has proven to be the most relevant to analyse the quality of work. We use the terms "formal (informal) worker" and "formal (informal) sector" indistinctly, and both refer to the worker's situation with respect to the Social Security coverage. In this sense, Gasparini & Tornarolli (2009) found that this type of question is the one used mainly in Latin America to capture informality from a "legalistic" or "social protection" notion.

[2] http://www.cedlas.econo.unlp.edu.ar/wp/estadisticas/lablac/estadisticas-lablac/ Source: Labor Data Base for Latin America and the Caribbean - LABLAC (CEDLAS and the World Bank).

domestic work is that in which a person in relation of dependence, provides to another or others care and work at home, in tasks related to it, without these tasks may represent for the employer a direct financial gain[3].

To achieve the objective, we use a dual-economy density discontinuity research design developed by Jales (2017). Specifically, we exploit the discontinuity in wage density at the MW both for the formal and the informal sector using cross-sectional data from the National Household Survey (NHS) for the period between 2006 and 2016. We find significate effects of the MW over wages, employment and sector mobility. Almost 20% of women increases their wages to reach the MW with little negative effects on employment in the domestic sector (3%). We also find undesired effects over formality which, based on administrative data seem to be offset by others labour policies implemented such as inspections and awareness campaigns.

The main contribution of this paper is to generate new empirical evidence on MW effects by using a recent and novel identification strategy with several crucial advantages in the context of developing countries with high presence of informal sectors not covered by the MW. This methodology allows to analyse the effects on formal-informal mobility as it analyses the joint distribution of sector and wages, unlike other methodologies that analyse each sector separately. In addition, this methodology is not data intensive and only requires cross-sectional data -which is the most common type in Latin American countries-, and is based on relatively flexible assumptions that can be tested with the available data. Furthermore, this paper contributes with the growing minimum wage literature in developing countries by focusing in the domestic work sector.

The particular analysis of the domestic work sector is highly relevant in the context of Latin American countries for at least two reasons. Firstly, due to the strong occupational segregation and sexual division of labour, domestic work sector is highly feminized: 10,7% of employed women in Latin American countries are domestic workers. Secondly, it has particularly high informality rates, only 26,9% of women in the domestic work sector have social security coverage. The situation of domestic work sector is heterogeneous among countries, pointing out the case of Uruguay that has positioned itself as a pioneer in the region with the early implementation of labour policies that promote regulation and formalization of domestic workers (ILO, 2016). In this context, domestic work sector is key for reducing labour gender gaps and contributing to the understanding of the impacts of MW regulations in the informal sector.

Considering the findings, minimum wage fixing in the domestic sector have had favourable results in the determination of decent wage floors but with undesired effects over formality. Results highlight the importance of applying broad labour policies that include not only wage fixing but also the inspection of labour conditions and dissemination campaigns to mitigate the negative effect over formality. Furthermore, given the reasonable non-employment effect found in comparison with other developing countries, MW policies seems to be an interesting instrument towards reducing poverty and inequality. These results are expected to contribute to the improvement of MW and formalization policies for the domestic work sector in Uruguay and other Latin American countries.

The work is organized as follows, the next section provides a review of the theoretical and empirical literature and section 4 briefly describes the Uruguayan background. In section 5, empirical approach is described, and then, section 6, introduces the data set and a descriptive analysis. Section 7 presents the results. Finally, section 8 summarizes the main results as well as the policy implications.

[3] Domestic work is operationalized as people who work at the economic activity denominated "Activities of Households as Employers of Domestic Personnel" (International Standard Industrial Classification of All Economic Activities, ISIC), belonging to one of the following occupations (International Standard Classification of Occupations, ISCO): Child Care Workers, Home-based Personal Care Workers, Companions and Valets and Domestic Cleaners and Helpers. The legislation considers the existence of two work regimes: live-in domestic workers and those who leave the working place. In this paper only the second ones are considered since the live-in worker's regime is rarely used in Uruguay and their work characteristics have relevant differences for the analysis.

3 Literature review

3.1 Theoretical considerations

In this section, we briefly discuss the effects of implementing a minimum wage policy in the context of developing countries with high proportion of informal workers not covered by the labour policies. The objective is to derive the different causal mechanisms that mediate between MW and labour market outcomes based on the predictions of the different stands of the theoretical literature.

The neoclassical model with competitive setting predicts that the introduction of MW will increase wages above the marginal product generating a compression on the wage distribution but with negative effects on employment. However, since 1990 research began to question the mainstreaming on the impact of MW and there is a vast literature finding null or even positive effects of MW on employment (Holmlund, 2014). Since then the debate has expanded and new theories have emerged based on models with imperfect competition settings which predict that the introduction of MW can increase wages without reducing employment. These findings are based on imperfect competition by monopsonistic markets where firms have some market power in wage setting, imperfectly mobile workers and incomplete information (Lustig & McLeod, 1996).

However, these predictions implicitly consider full enforcement in the MW policy, which is not the case of labour markets in developing countries, such as Latin American economies. Developing countries MW studies have taken into account the existence of dual labour markets characterized by the presence of a formal sector and an informal sector for which MW legislation is not binding (Gindling & Terrell, 2005, 2007, 2009; Lemos, 2009; Maloney & Núñez, 2004). The standard two-sector competitive model predicts that following a MW hike, workers displaced in the formal sector will move from the formal to the informal sector. Hence, employment in the informal (formal) sector increases (falls) and wage falls (increases). Overall, 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 wages are flexible in the informal sector. Mincer (1976) states that the effects of MW will depend on the direction of the flow of workers, arguing that workers can move from the informal to the formal sector, for example, in the search for better paid jobs, even facing the possibility of unemployment periods. Thus, the final effect of MW depends on the size and elasticity of labour supply and the demand in the formal and informal sectors, allowing wages to rise in the informal sector if unemployment rises enough.

Other Latin American studies that find evidence of wage increases in the informal sector explain these results based on the theory of the lighthouse effect. The predictions of this theoretical model is that the MW, which operates only in the formal sector, is taken as a reference price for negotiation also in the informal sector. If informal firms have any monopsonistic power, the implementation of MW in the formal sector will increase also wages of the informal sector (Souza & Baltar, 1980 in Boeri, Garibaldi & Ribeiro, 2011). Another justification of the increase of informal wages is based on the shadow employment and sorting mechanism in which workers decide whether to search work in the shadow sector not covered by the MW or in the legal sector covered by the MW. The meeting of jobs and workers is regulated by a sorting mechanism with different transition functions between sectors, such that in absence of MW, low skill workers will concentrate in the shadow sector. But the introduction of a MW changes the sorting mechanism and the skill composition of sectors: the increase in skill level of shadow sector also increases their wages (Boeri, Garibaldi & Ribeiro, 2011; Fajnzylber, 2001).

As mentioned in previous studies for Latin American countries, it is theoretically difficult to predict the redistributive/wage effects of MW on different groups of workers (Gindling & Terrel, 2009). In turn, the expected effects will also depend on the specific conditions of the labour market (wage levels, sector mobility) and the characteristics of the MW policy (coverage, size of the increase). As Holmlund (2014) points out, recent economic research on the labour effects of MW relied more on empirical studies than on the development of

theoretical models. This paper does not aim to contribute to the theoretical conceptualization, but rather aims to contribute to the empirical literature from a conceptual framework of imperfect labour market competition.

3.2 Empirical studies

In this section we systematize the empirical literature that uses data from Latin American countries to evaluate the employment and wage effects of MW. Evidence about the possible consequences of raising MW has become a topic of interest as well as controversial. Many studies systematize the evidence and conclude that the literature is not decisive regarding the effects of MW, but rather it depends on the methodology implemented, the conceptual framework of the informal sector, the definition of informality, as well as the characteristics of the MW policy (Neumark, 2017; Campos et al., 2015; Groisman et al., 2015; Gindling & Terrell, 2009; Neumark & Wascher, 2007).

Some early studies focused on developed countries found that an increase in the MW does not produce adverse effects on employment (Card & Krueger, 1994; Katz & Krueger, 1992; Dickens, Machin & Manning, 1999; Stewart, 2004) while other studies found that an increase in the MW reduces employment of less skilled workers (Neumark & Wascher, 2007; Addison & Ozturk, 2010; Butcher, Dickens & Manning, 2012). Neumark (2017) summarizes US studies highlighting on the conflicting evidence about labour effects of minimum wages.

More recently, the debate has emerged in the developing countries focused on the effectiveness of MW in economies with high presence of informal sector which is not covered by the policy (Marinakis & Bueno, 2014). In particular, Latin American studies have found mixed effects on employment, formality and wages (Groisman et al., 2015).

Employment effects for developing countries are in general negative, showing significant unemployment effects (Addison & Ozturk, 2010; Gindling & Terrell, 2009, 2007; Neumark et al, 2005; Maloney & Núñez, 2004; Wellington, 1991). In particular, Gindling and Terrell (2005, 2007,2009) study the cases of Costa Rica and Honduras applying the dynamic panel data model developed by Arellano & Bond using an industry-level panel based on cross-sectional data. They found negative effects on employment, especially for the informal sector where less skilled people works. However, the definition of uncovered workers is considerably different to the Uruguayan case because is associated with self-employed and unpaid family work. On the other hand, as in developed countries, some studies found no effects on global employment nor for workers in the informal sector (Dinkelman & Ranchhod, 2012; Lemos, 2009).

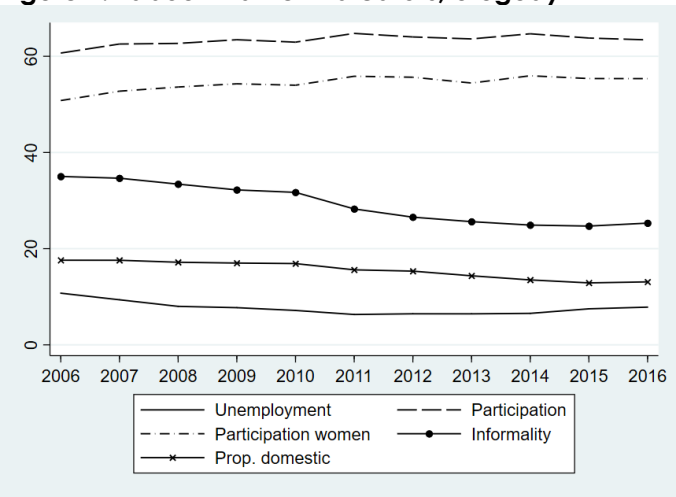
Wages effects are usually positive, showing and increase on average wages (Gindling & Terrell, 2009) and of formal and informal workers (Boeri et al., 2011), increase on wages of low income workers (Neumark, 2005), and decrease in the wage gap between formal and informal (Gindling & Terrell, 2005). The study of Dinkelman & Ranchhod (2012) and Lemos (2009) stands out as they found that the introduction of MW increases average wages without undesired effects over employment. Dinkelman & Ranchhod (2012) analyses the introduction of a MW in the domestic work sector in South Africa by using a difference-in-differences approach taking advantage of variation of intensity of treatment across regions. Lemos (2009) study the case of Brazil based on the theoretical framework of standard Welch–Gramlich–Mincer Two Sector Model. She also found evidence of wage compression in formal and informal sector, being MW policy and effective instrument towards poverty and inequality reduction. These findings are in contrast with segmented labour market theories, providing evidence in favor that formal and informal sectors can behave as integrated competitive markets.

In terms of the methodological approach Jales (2017) is the most relevant empirical reference. He developed a dual economy density discontinuity approach based on Doyle (2006) to evaluate the impacts of MW over unemployment, wages, wage inequality, sector mobility, size of the informal sector and labour tax revenues for Brazilian economy. The author finds evidence of an important increase of the informal sector due to the MW policy.

4 Background

Uruguay is a Latin American country that stands out in the region for its high per capita income, low level of inequality and poverty and high Human Development Index. During the last decade Uruguayan economy experienced a high dynamism: between 2006 and 2016, average GDP growth was 4.7%. In particular, regarding labour market Figure 1 shows that Uruguay registered in the last decade low levels of unemployment rates, significant reduction in informality and increase in real wage. In terms of gender gaps, women participation rate shows a systematic increase in the last decade and, therefore, participation gap has decrease. Nevertheless, this integration process has been characterized by a strong occupational segregation and women have been largely incorporated in occupations with unfavourable working conditions and lower wages (CIEDUR, 2017; Inmujeres-MIDES, 2016; Espino, Salvador & Azar, 2014; Katzkowicz & Querejeta, 2012; Amarante & Espino, 2008). In particular, the domestic work sector has been associated with women's responsibilities as a result of the traditional sexual division of labour, thus having a greater female representation: in 2016 99.4% of the people employed in the sector are women and this represents 13.1% of total women employment. The feminization of the domestic work sector has undervalued this occupation, associated with higher levels of informality: while being approximately 25% in 2016 for all workers, it raises to 45.6% for women in the domestic work sector.

Figure 1: Labour market indicators, Uruguay



Notes: The dataset corresponds to the NHS from 2006 to 2016. Results may not correspond to that in Figure 6 because this sample corresponds to all men and women older than 14 years age.

Regarding social protection system, Uruguay is recognized in Latin America for its strength and breadth. Informality is one of the lowest in the region despite being at high levels compared to developed countries (Gasparini & Tornarolli, 2009). Early labour policies have been the protagonists of this social protection system, while the benefits of social security are closely linked to the formal labour market. There are two main policies to explain Uruguayan labour markets condition in relation to wages: National Minimum Wage and Collective bargaining. The National Minimum Wage (NMW) was introduced in 1969[4] covering private salaried workers over 18 years old but excluding rural and domestic workers. Collective bargaining between workers, business chambers and the State was installed in 1943[5], they are organized in groups related to the economic activity and rural, domestics and public workers were excluded of this regulation until 2005.[6] Both policies are applied

[4] Decree 1534/969 of 28th November 1969.

[5] Law 10,449. Also known as Wage Councils because one of the main issues negotiated is the wage. Wage Councils did not work continuously but in the periods 1943-1957; 1985-1989, 2005 to the present.

[6] Information about collective bargaining by economic groups is available at: https://www.mtss.gub.uy/web/mtss/consejos-de-salarios

to formal workers that is, workers registered in the Social Security Institute (SSI) by the employee, and nobody who has the inscription in the SSI could receive a wage under the NMW or the wage negotiated in collective bargaining. It is important to explain that although regulation on MW existed in Uruguay since 1943, as in several Latin American countries, they were not effective to operate on the determination of wages floors (Marinakis, 2014). However, since 2005, with the restoration of collective bargaining, these policies have regained importance in establishing a decent wage floor.

Finally, regarding domestic work sector, the main policy milestone was the Law No. 18.065 passed in 2006, that implied a substantial change in the labour regulatory framework. The Law imposes wage fixing through collective bargaining, dissemination campaigns to promote the formalization of workers and inspection mechanisms, among others. Thus, Uruguay has positioned as a pioneer in the region with the implementation of labour and social policies that promote regulation and formalization of domestic workers (ILO, 2016).

5 Empirical approach: dual economy density discontinuity approach

5.1 The model of analysis

In first place, we briefly describe the dual economy density discontinuity research design to evaluate the effects of a minimum wage in the context of economies with both formal and informal labour sector. Based on Doyle's model (2006) which analyzes the MW effects over wages and employment exploiting the discontinuity of the marginal distribution of wages in the MW point, Jales (2017) develops an extension for the case of a developing country with large informal sector by analyzing the joint distribution of wages and sectors. Basically, Jales´s framework proposes modelling the joint distribution of wages and sector both for the observed and the latent distribution. Empirically this is implemented combining a non-parametric density discontinuity design together with a parametric model for the conditional probability of the sector given the wage.

We will denote S_i the sector to which worker i belongs, taking value 1 if the worker belongs to the formal sector and 0 if belongs to the informal one, and W_i which denotes the wage of worker i. Additionally, we will define a pair of S_i and W_i $\big(W(1), S(1)\big)$ which denotes the setting for the observed wages and sector joint distribution, while $\big(W(0), S(0)\big)$ identifies the latent wages and sector. The latter is the underlying joint distribution or counterfactual, that is, the distribution in absence of MW policy. Finally, we will denote $F_0(w)(f_0(w))$ as the CDF (pdf) of $W(0)$ (latent wages) and $F(w)\big(f(w)\big)$ as the CDF (pdf) of $W(1)$ (observed wages).

In order to estimate this parameters, we follow Jales (2017) and make a series of assumptions regarding to the behaviour of the analysed labour market. First of all, in order for the methodology to be applied there has to be discontinuity on the observed wage distribution around the MW. Secondly, the model assumes that the density of latent wages and its first derivative exist, are non-zero and continuous at m. Thirdly, the conditional probability of the latent sector given latent wages can be described by a parametric model. Fourthly, no spillover are allowed: workers with latent wages above the MW are not affected by the policy. This implies that if the latent wage is above the MW, both the wages and the sector will not be affected for the policy[7]. Fifthly, the probabilities that measure the effects of MW are the same for all workers, therefore this parameter should be interpreted as an average over the mass of affected workers. Sixthly, the probabilities do not depend on the workers' latent wage. Seventhly, wages of informal workers below the MW are not affected by the possible inflow of formal workers[8]. Additionally, in order to apply this methodology to the case of a single employment sector, it is necessary to assume that there is no migration of workers from other sectors to the domestic work

[7] Jales shows that the magnitude of the estimates has little change when limited spillovers are allowed.

[8] Some of this assumption are tested in Annex 1 and Annex 2. As will be shown in the next section, assumptions 3 and 4 are critical for identification strategy.

sector after the introduction of MW. This could invalidate the strategy since the density of wages would not be integrated to one. The decrease of employment in the domestic work sector (Figure 1) and the fact that since 1969 there is a national MW for the other sectors whose amount is similar to that of domestics[9], allow to sustain that the assumption is reasonable for the purposes of this study.

Once these assumptions are made, we can complete the model for minimum wage effects by defining that if the latent wage is lower than the MW in domestic work sector (m) and the worker is formal in the latent distribution, with probability π_{d}^{1} maintains the same wage and migrates to the informal sector (non-compliance), with probability π_{m}^{1} increases her wage to the minimum and remains in the formal sector (compliance) and with probability π_{u}^{1} becomes unemployed or employed in other work sector.

$$If\ W(0) < m\ \&\ S(0) = 1 \rightarrow \big(W(1), S(1)\big) = \begin{cases} (W(0), 0)\ with\ probability\ \pi_{d}^{1} \\ (m, 1)\ with\ probability\ \pi_{m}^{1} \\ (.,.)\ with\ probability\ \pi_{u}^{1} \end{cases}$$

Additionally, if the latent wage is lower than the MW and the worker is informal in the latent distribution, with probability π_{d}^{0} maintains the same wage and remains in the informal sector (non-compliance), and with probability π_{m}^{0} increases her wage to the minimum and remains in the informal sector (compliance).

$$If\ W(0) < m\ \&\ S(0) = 0 \rightarrow \big(W(1), S(1)\big) = \begin{cases} (W(0), 0)\ with\ probability\ \pi_{d}^{0} \\ (m, 0)\ with\ probability\ \pi_{m}^{0} \end{cases}$$

Given this theoretical model, the objective is to estimate the parameters (π_{d}^{1}, π_{m}^{1}, π_{u}^{1}, π_{d}^{0}, π_{m}^{0}) and the joint distribution of latent sector and wages. Below we present the economic interpretation of each parameter, taking into account that in all cases they refer to workers with latent wages lower than MW:

Probability of non-compliance for formal domestic workers *(π_{d}^{1}).* This parameter quantifies the shift of workers from the formal to the informal sector due to the introduction of the MW, that is the proportion of formal domestic workers that maintain the wage below the minimum and therefore migrate to the informal sector with the same wage than in formal domestic sector.

Probability of compliance for formal domestic workers *(π_{m}^{1}).* This parameter quantifies the effect of the introduction of MW over the wages of formal workers, that is the proportion of formal domestic workers which observe an increase in their salary to fulfil the MW regulation.

Probability of non-employment for formal domestic workers *(π_{u}^{1}).*[10] This parameter quantifies the reduction in employment in the domestic work sector due to the policy. Since this study is based on a single economic sector, the parameter that in the original model quantifies for the unemployment effect, in this case quantifies the decrease in employment of the domestic sector without discerning whether it is unemployment or shift of workers to another sector.

Probability of non-compliance for informal domestic workers *(π_{d}^{0}).* This parameter measures the proportion of informal domestic workers who maintain the same pre-policy wage (below the minimum).

Probability of compliance for informal domestic workers *(π_{m}^{0}).* This parameter quantifies the proportion of domestic workers who increase their salary to match the MW, but remain in the informal sector.

[9] For the analysed period hourly MW was on average 15% higher for the domestic sector in relation to the NMW.

[10] Folowing Jales (2017) we present results for the model parameter $\boldsymbol{\pi_u}$ which accounts for the probability of non-employment for total domestic workers although it refers only to formal workers.

5.2 Identification and estimation

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

$$f(w) = I(w < m)\frac{\pi_d(w)f_0(w)}{c} + \delta(w-m)\int^m \frac{\pi_m(w)f_0(w)}{c}dw + I(w > m)\frac{f_0(w)}{c}$$

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

$$c = 1 - \int^m \pi_m^1 \, \Lambda(w) \, f_0(w)dw$$

For the formal sector the wage density is given by:

$$f(w|S(1)=1) = I(w < m)0 + \delta(w-m)\frac{\pi_m^1 F_0(m|S(0)=1)}{c^1} + I(w > m)\frac{f_0(w|S(0)=1)}{c^1}$$

While for the informal sector the wage density is:

$$f(w|S(1)=0) = I(w < m)\frac{\pi_d(w)f_0(w|S(0)=0)}{(1-\Lambda(w))c^0} + \delta(w-m)\frac{\pi_m^0 F_0(m|S(0)=0)}{c^0} + I(w > m)\frac{f_0(w|S(0)=0)}{c^0}$$

Where the specific factor c that allow densities from both sector to integrate to one are:

$c^1 = 1 - F_0(m|S(0)=1)(1-\pi_m^1)$ and $c^0 = 1 + \pi_d^1 \int^m \frac{\Lambda(w)}{1-\Lambda(w)} f_0(w|S(0)=0)dw$

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

$$\pi_d = \lim_{\epsilon \to 0} \frac{f(m-\epsilon)}{f(m+\epsilon)}$$

Based on evidence in Annex 2 we assume independence between sector and wages is fulfil, so we estimate the density of wages at the MW using local linear density estimators and, as suggested by Jales (2017), we use the plug-in approach for the remaining parameters. In this sense, the probability of compliance for domestic workers is estimated as the probability of non-compliance weighted by the fraction at the MW in relation to the fraction below MW:

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

The total probability of non-employment on domestic sector (π_u) is estimated by difference. The parameters for each sector depends on the identification of the latent size of the formal sector. So, the main issue in the identification of the MW effects separately for formal and informal sector is assuming that the conditional probability of the sector given wages is preserved once MW is introduced. That allows to extrapolate the shape of the relationship above the MW for wages below the MW level. Thus, the probability of non-employment for formal domestic workers is estimated as π_u rescaled by the latent size of the formal sector (Λ):

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

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

$$\pi_m^1 = \frac{\Pr[W(1)=m/S(1)=1]}{1-\Pr[W(1)=m/S(1)=1]} * \frac{1-F_0(m)}{F_0(m)}$$

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

$$\pi_m^0 = \frac{\pi_m - \Lambda\pi_m^1}{1 - \Lambda}$$

The probability of non-compliance for informal domestic workers is estimated as the compliance probability complementary:

$$\pi_d^0 = 1 - \pi_m^0$$

Finally, the probability of non-compliance for formal domestic workers is estimated as the complementary of the other two probabilities for formal domestic workers:

$$\pi_d^1 = 1 - \pi_m^1 - \pi_u^1$$

It is important to mention that the main issue in estimating the effects of MW under Jale's methodology for the Uruguayan case was that, in our case, there were no workers earning exactly the minimum wage, so we define the fraction at the MW as the workers whose difference between wages and MW was between ±0,05 standard deviation of the average hourly wages.[11]

6 Data and descriptive analysis

The empirical analysis is based on information from the cross-sectional data of the National Household Survey (NHS) performed by the National Institute of Statistics covering 2006-2016. The survey collects information at household and individual level since 1981 and is representative of entire population since 2006.[12] Our sample includes all women, between 18 and 69 years old, who declare being employed at the domestic work sector[13] and are not retired[14]. All model estimations are based on a final sample of 44,821 cases representing 2.9% of the total NHS sample size.

The analysis of enforcement also uses information of labour inspections from the SSI.

Before evaluating the effects of the MW, we briefly show some descriptive statistics based on a pool of cross-section of the NHS from 2006 to 2016. Table 1 compares personal and labour characteristics of women employed in the domestic work sector with the total of women employed. Domestic workers are older, less educated and the percentage of afro-descendant is higher than the total of women employed. Additionally, domestic workers come from households with children under 18 to a greater extent than the total of women employed, and to a less extent from households of the capital city. Finally, domestic workers are more likely to be in the 40% of lowest family income. Regarding labour conditions, average hourly wages for women employed in domestic sector is lower than for total of women employed. Domestic workers are characterized by lower tenure and a high level of informality compared to the total of women employed.

[11] We estimate the model using different definitions of fraction at minimum wage obtaining similar results (Table 12, Annex 5).

[12] Estimations are computed using survey weights elaborated by National Institute of Statistics.

[13] This implies people who work at the economic activity denominated "Activities of Households as Employers of Domestic Personnel" (International Standard Industrial Classification of All Economic Activities, ISIC), belonging to one of the following occupations (International Standard Classification of Occupations, ISCO): Child Care Workers (5311), Home-based Personal Care Workers (5322), Companions and Valets (5162) and Domestic Cleaners and Helpers (9111). There are excluded the live-in domestic workers, considering only those who leave the working place

[14] A person may be working and being retired from another economic activity at the same time.

Table 1: Personal characteristics and working conditions of women employed in the domestic work sector and total women employed, 2006-2016

		Domestic sector	All employed women
Personal characteristics			
Age	**18-35**	0.29	0.39
		(0.45)	(0.49)
	36-69	0.71	0.61
		(0.45)	(0.49)
Years of education	**Less than 7 years**	0.46	0.20
		(0.50)	(0.40)
	7 years or more	0.54	0.80
		(0.50)	(0.40)
Children under 18 in household	**No**	0.39	0.44
		(0.49)	(0.50)
	Yes	0.61	0.56
		(0.49)	(0.50)
Afro	**Non-afro**	0.86	0.91
		(0.35)	(0.29)
	Afro	0.15	0.09
		(0.35)	(0.29)
Region	**Capital city**	0.34	0.45
		(0.48)	(0.50)
	More than 5.000 hab.	0.53	0.44
		(0.50)	(0.50)
	Less than 5.000 hab.	0.13	0.11
		(0.34)	(0.32)
Household income	**40% lower income**	0.53	0.28
		(0.50)	(0.45)
	60% higher income	0.47	0.72
		(0.50)	(0.45)
Labour conditions			
Hourly wage		90.7	140.2
		(55.37)	(104.30)
Tenure		4.8	7.9
		(6.58)	(9.21)
Informal sector		0.54	0.25
		(0.50)	(0.43)
		44,821	241,523

Notes: The sample corresponds to all employed women, between 18 and 69 years old and not retired. The dataset corresponds to the NHS from 2006 to 2016. Each row presents frequency or mean for each variable of interest. In column (1) the data corresponds to domestic sector and in column (2) the data corresponds to all work sectors. The personal characteristics include the age, years of education (both constructed in tranches), presence of children (a dummy variable equal to 1 for women in households with children under 18 years old and 0 otherwise), afro (a dummy variable equals to 1 for afro descendants and 0 otherwise), the region of residence and household income (a dummy variable equals to 1 if household is between 40% of lower income and 0 otherwise). Labour conditions include hourly wage (net wage measured in Uruguayan pesos indexed to CPI of December 2016), tenure (measure in years) and informal sector (a dummy variable equal to 1 for workers employed in the informal sector and 0 otherwise). Standard errors in parentheses.

Table 2 presents personal and labour characteristics of formal and informal women working in the domestic work sector. In relation to personal characteristics, informal workers are younger, less educated, live mostly in household with children under 18 and in greater proportion are afro-descendants compared to formal ones. Formal workers are more concentrated in the capital city and informal workers in other urban cities of the country. Considering the family income, informal workers are more concentrated in the 40% of lower income and regarding labour conditions, informal workers has less tenure and earn less hourly wages determining a higher percentage of workers below minimum wage in this sector than in the formal one.

Table 2: Personal characteristics and working conditions of women employed in domestic work by sector, 2006-2016

		Informal sector	Formal sector	Difference	Std. Error
Age	**18-35**	0.346	0.221	0.125***	0.004
	36-69	0.654	0.779	-0.125***	0.004
Years of education	**Less than 7 years**	0.475	0.439	0.036***	0.005
	7 years or more	0.525	0.561	-0.036***	0.005
Children under 18 in household	**No**	0.356	0.433	-0.077***	0.005
	Yes	0.644	0.567	0.077***	0.005
Ethnicity	**Non-afro**	0.848	0.864	-0.016***	0.003
	Afro	0.152	0.136	0.016***	0.003
Region	**Capital city**	0.297	0.398	-0.101***	0.005
	More than 5.000 hab.	0.571	0.474	0.097***	0.005
	Less than 5.000 hab.	0.132	0.128	0.004***	0.003
Household income	**40% lower income**	0.650	0.394	0.256***	0.005
	60% higher income	0.350	0.606	-0.256***	0.005
Labour conditions	**Hourly wage**	74.8	109.3	-34.5***	0.5
	Tenure	3.1	6.6	-3.5***	0.1
	Workers below MW	0.247	0.051	0.196***	0.003
Obs.		24,814	20,007		

Notes: The sample corresponds to all women in the domestic work sector, between 18 and 69 years old and not retired. The dataset corresponds to the NHS from 2006 to 2016. Each row presents the frequency or mean for each variable of interest. In column (1) the data corresponds to the domestic formal sector, in column (2) the data corresponds to the domestic informal sector and in column (3) the difference between the formal and the informal sector. Personal characteristics include age, years of education (both constructed in tranches), presence of children (a dummy variable equal to 1 for women in households with children under 18 years old and 0 otherwise), afro (a dummy variable equal to 1 for afro descendants and 0 otherwise), the region of residence and household income (a dummy variable equals to 1 if household is between 40% of lower income and 0 otherwise). Labour conditions include hourly wage (net wages measured in Uruguayan pesos indexed to CPI of December 2016), tenure (measured in years) and proportion of workers below minimum wage. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 3 shows the probabilities of belonging to the formal or informal sector and of earning more or less than the minimum wage, conditional on different characteristics, for women employed in the domestic sector. The unconditional probability of belonging to the formal sector is lower than the probability of earning more than the MW. Given this, we would expect that a high percentage of informal domestic workers were above the MW. In fact, we observe that the probability of being above the MW is lower for informal workers compared to formal ones, but still high considering that MW is not enforced in the informal sector. Considering the probability of sector conditional on wage, we find that workers above the MW belong mostly to the formal sector, while the opposite happens for workers below MW. When considering the ethnicity, years of education, and presence of children in household there are no relevant differences, either in the likelihood of belonging to the formal sector or in the probability of earning more than the MW. Considering age, geographical region and household income, we observe significant differences. Older workers, in the capital city and in the 60% of higher family income register higher probability of being in the formal sector and earning more than the MW.

Table 3: Conditional probabilities of belonging to the formal or informal sector and earn more or less than the MW for women employed in the domestic sector, 2006-2016

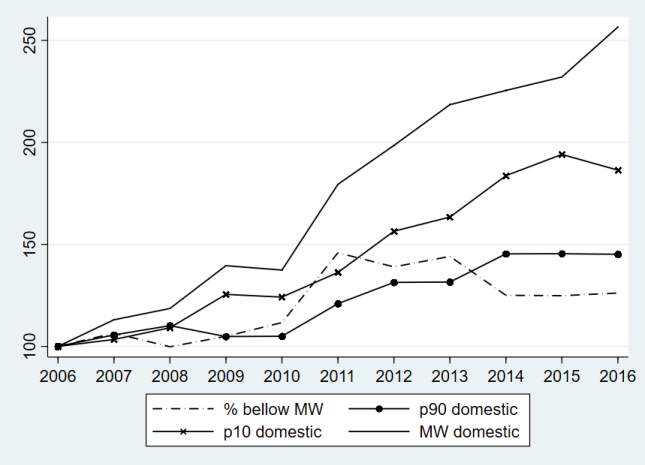
	P(S=1)	P(S=0)	P(W>=m)	P(W<m)
Unconditional	0.461	0.539	0.843	0.157
Conditional on sector				
Formal	1	0	0.949	0.051
Informal	0	1	0.753	0.247
Conditional on wage				
W>m	0.518	0.482	1	0
W<m	0.151	0.849	0	1
Conditional on age				
18-35	0.352	0.648	0.789	0.211
36-69	0.504	0.496	0.865	0.135
Conditional on education				

Less than 7 years	0.441	0.559	0.833	0.167
7 years or more	0.477	0.523	0.852	0.148
Conditional on having children in the house				
With children	0.430	0.570	0.843	0.157
Without children	0.550	0.450	0.845	0.155
Conditional on ethnicity				
Afro	0.434	0.566	0.832	0.168
Non-afro	0.465	0.535	0.845	0.155
Conditional on region				
Capital city	0.534	0.466	0.918	0.082
More than 5.000 hab.	0.415	0.585	0.805	0.195
Less than 5.000 hab.	0.453	0.547	0.797	0.203
Conditional on household income				
40% lower income	0.341	0.659	0.785	0.215
60% higher income	0.597	0.403	0.909	0.091

Notes: The sample corresponds to women employed in the domestic sector, between 18 and 69 years old and not retired. The dataset corresponds to the NHS from 2006 to 2016. Each row presents probabilities conditional on different characteristics. In column (1) the data presented corresponds to the probability of being employed in the formal sector, column (2) corresponds to the probability of being employed in the informal sector, column (3) refers to the probability of earning the minimum wage or more and column (4) refers to the probability of earning less than the minimum wage.

Figure 2 presents the evolution of the hourly MW for domestic workers and observed hourly net wages showing a considerable increase, being the 10th percentile of domestic workers' observed wages the one with the largest growth. While the 90th percentile increased 45%, the 10th percentile almost doubles this number, giving ground for the hypothesis that changes in wages regulation may have particularly affected workers with lowest earnings, reducing wage inequality in the sector. Considering the evolution of wage regulations in the domestic work sector, the MW has increased in approximately 160% since 2006 until 2016. Combining both analysis, we observe an increase of 26% in the percentage of workers below the MW in the period under analysis explained by a greater increase in the MW in comparison to wages.

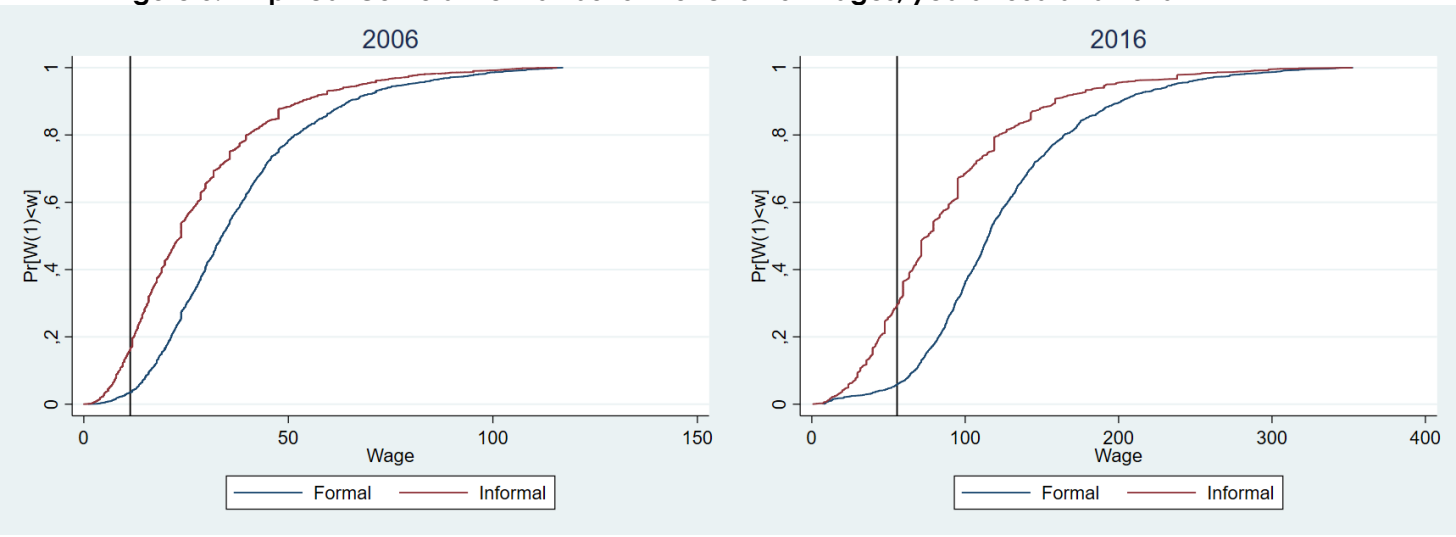
Figure 2: Evolution of the observed hourly wages, hourly MW and percentage of workers below the minimum wage, 2006-2016



Notes: The sample corresponds to all women, between 18 and 69 years old and not retired. The dataset corresponds to the NHS from 2006 to 2016. The figure plots the evolution of the following indicators normalized to 2006 values: percentage of women employed in the domestic sector earning less than the MW, observed average of net hourly wages for domestic workers for the 10th and 90th percentile, and the minimum wage in the domestic sector for January of each year according to collective bargaining. Percentiles of net hourly wages indexed to CPI of December 2016 built on a mobile basis for each year.

Finally, we present the empirical cumulative distribution function of wages for the formal and informal sectors in each year. Although we doesn't observe a spike around the MW level, consistently with the data presented in Table 3 the proportion of workers bellow the MW is higher in the informal than in the formal sector.

Figure 3. Empirical Cumulative Distribution Function of Wages, years 2006 and 2016



Notes: The sample corresponds to all women employed in the domestic sector, between 18 and 69 years old and not retired. The dataset corresponds to the NHS from 2006 and 2016. Empirical CDF of Wages for all years are presented in 3.

7 Labour market responses to MW

In this section we present the main findings of the effects of minimum wages in the domestic sector over wages, employment and sector mobility between formal and informal sector. Firstly, we present the main results of the estimated model for the years 2006 to 2016 and for the pooled data. Then, we analyse more in depth the sector mobility effect in light with the stylized facts evidence for the Uruguayan case, as well as the non-employment effect in order to shed light if its due to unemployment or shift of workers to other economics sectors. Finally, we will estimate heterogeneous effects by region, age, presence of minors in the household, ethnicity and level of education, by estimating the parameters separately for each group. In Annex 5 we present different robustness checks for the estimation.

7.1 Global minimum wage effects

Results are presented firstly for the entire domestic work sector and then separately for the formal and informal domestic work sector. Table 4 reports all model parameter estimates for the pooled data, showing significate effects of the minimum wage over wages, employment and sector mobility. It is necessary to remember that the probability parameters refer to the mass of affected workers with latent wages below the MW ($F_0(m)$). This parameter accounts for 20.2% of women in domestic work sector being affected by the policy. On average, the probability of compliance (π_m) reaches 19.2%. That is, almost 20% of women in the domestic work sector below the MW level in the latent distribution, receives the minimum wage after the analysed labour policy. However, we also find a significant effect on the probability of non-employment in the domestic sector (π_u) that reaches 15.3% for the pooled data. In order to have a comparable parameter of employment effect, we estimate a naive implied employment elasticity in the domestic work sector with respect to the MW. Result for a linear regression of the effect in non-employment in domestic sector over the logarithm of hourly minimum wage level gives a significant elasticity of 0.3. This figure is lower than that found for developed countries that are between 0.4 to 1.6, but similar to that found for Latin American countries for low-skilled workers that ranged between 0.15 and 0.33 (Maloney & Núñez, 2004). Considering the average minimum wage increases for the period (10%), we find that employment in the domestic sector decrease approximately 3% because of the introduction of a MW. So, although the non-employment effect is quite high, it turns to reasonable values when

applied to aggregate domestic employment. In section 6.1.3 we analyse if this effect is due to unemployment effect or to the shift of workers to other sectors. Finally the proportion of affected workers that are non-compliers with the minimum wage (π_d) amounts to 65.4%. The employment results are similar to those found for other Latin American countries (Gindling and Terrell, 2009; Neumark et al, 2005).

Analysing the effect of the policy separately for the formal and informal sector, we observe a high sector mobility (π_d^1): 64.5% of affected formal domestic workers before the MW policy shift to the informal sector due to the wage policy. That is, 64.5% of formal workers maintain the wage below the minimum and therefore migrate to the informal sector. In section 6.1.2 we analyse the implications of this result in light of the stylized facts verified for Uruguay in the period. 6.3% of formal workers reach the minimum wage level (π_m^1) and the remaining 29.2% correspond to the proportion of formal workers non-employed in domestic work sector.

On the other hand, 33.6% of the informal workers affected by the policy observe an increase in their salary to match the MW, although remaining in the informal sector (π_m^0). The proportion of affected informal workers that are non-compliers with the minimum wage (π_d^0) is 66.4%.The hypothesis is that the introduction of a MW enforced in the formal sector also acts as a signal in the wage setting in the informal sector, thus increasing the wages of informal workers due to lighthouse effect (Souza & Baltar, 1980 in Boeri, Garibaldi & Ribeiro, 2011).

Table 4: Model parameter estimates, pooled data

π_m	π_u	π_d	$F_0(m)$	π_d^1	π_m^1	π_m^0	π_d^0	Λ	Obs.
0.192***	0.153***	0.654***	0.202***	0.645***	0.063***	0.336***	0.664***	0.526***	44,821
(0.006)	(0.017)	(0.013)	(0.002)	(0.031)	(0.004)	(0.011)	(0.011)	(0.003)	

Notes: The sample corresponds to women employed in the domestic sector, 18 to 69 years old and not retired. The dataset corresponds to the NHS from 2006 to 2016. Standard errors in parenthesis computed by 100 bootstrap replications. *** p<0.01, ** p<0.05, * p<0.1

The parameters are similar to those found by Jales (2017), except for the total non-compliance probability and the probability for formal workers or sector mobility parameter which is much higher for the Uruguayan domestic worker's case. The mass of affected workers is also higher in Uruguay consistently with the fact that since 2005 minimum wages regain importance to operate on the determination of wages (Marinakis, 2014).

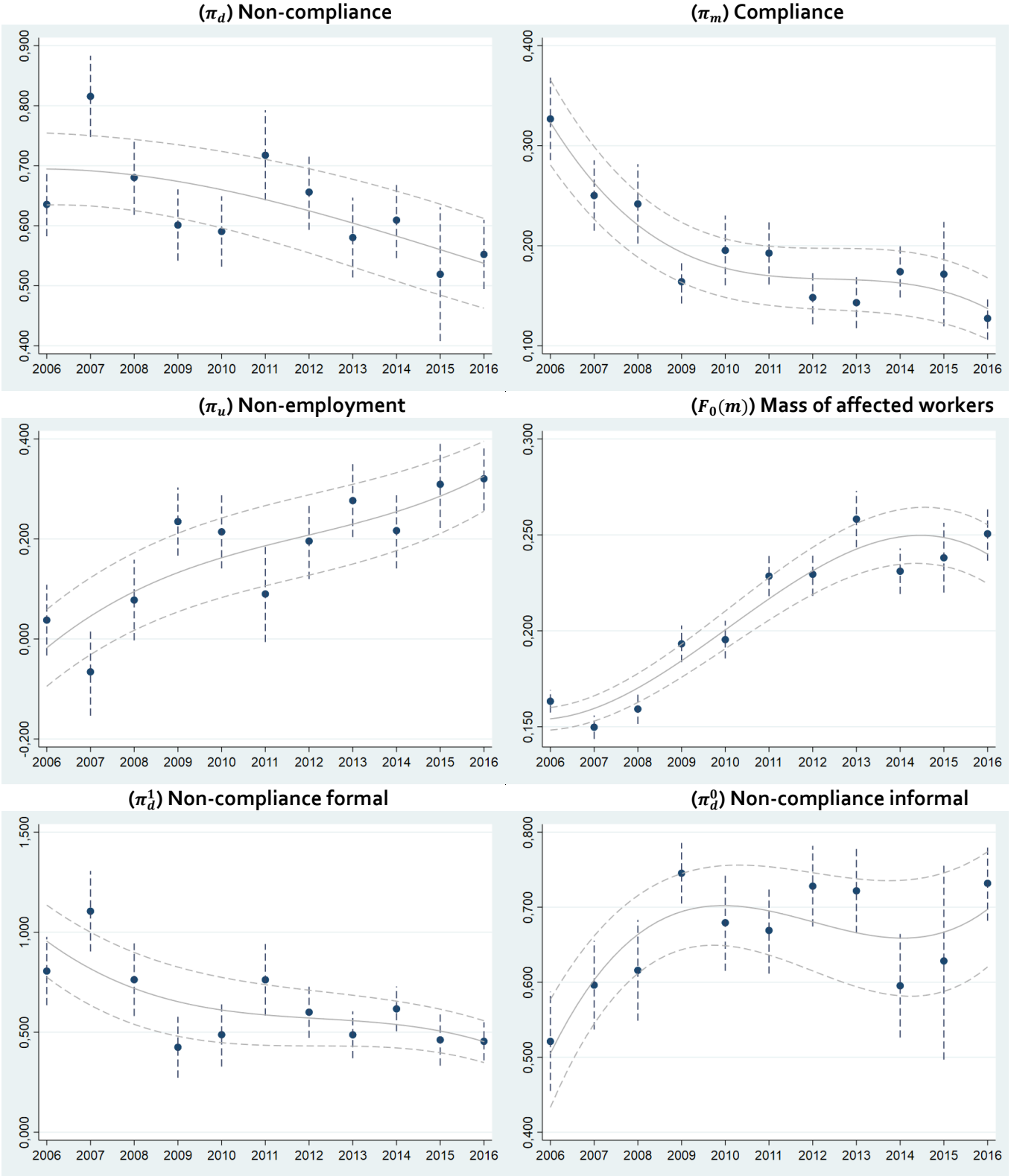
7.1.1 Dynamic of minimum wage effects

Figure 4 and Table 9 present the results for the evolution of all model parameter estimates over time, observing an increase in the mass of affected workers ($F_0(m)$) from 16.3% in 2006 to 25.1% in 2016. This is consistent with the evidence in Figure 2 that indicates a rise in the percentage of workers below the MW due to a greater increase in the MW in comparison to wages. It is necessary to mention that although it can be observed probability results greater than 1 and less than 0, in those cases the results are not significant.

We also observe a decrease in the probability of non-compliance (π_d) from 63.6% to 55.2% in the hole period although this difference it is not statistically significant. At the same time, we observe a significant decrease of the probability of compliance (π_m) from 32.7% to 12.7%. As a consequence, the probability of non-employment in domestic sector (π_u) significantly increases from 3.8% to 32%. A hypothesis is that in a period of economic growth and improvement in labour conditions, domestic workers could prefer to be unemployed or employed in other sector than maintain the wage below the MW in the domestic sector. This could be particularly true for the formal workers who may decide between shift to informal sector and lose all the benefits of social security or look for a job in other sector. Consistently, the sector mobility decreases in the analysed period and the probability of non-compliance for formal domestic workers (π_d^1) decreases from 80.3% in 2006 to 45.4% in 2016.

Additionally, we observe an increase in the probability of non-compliance for informal domestic workers (π_d^0) from 52.1% to 73.2%. Analysing that estimates together with the latent size of formal sector (Λ) that increases from 40.2% to 64.8% we may say that informal workers that stay in informal sector after 11 years of broad labour policies constitute the hard core of informality, so between them the probability of maintain the wage below the minimum is higher.

Figure 4: Evolution of model parameter estimates, 2006-2016



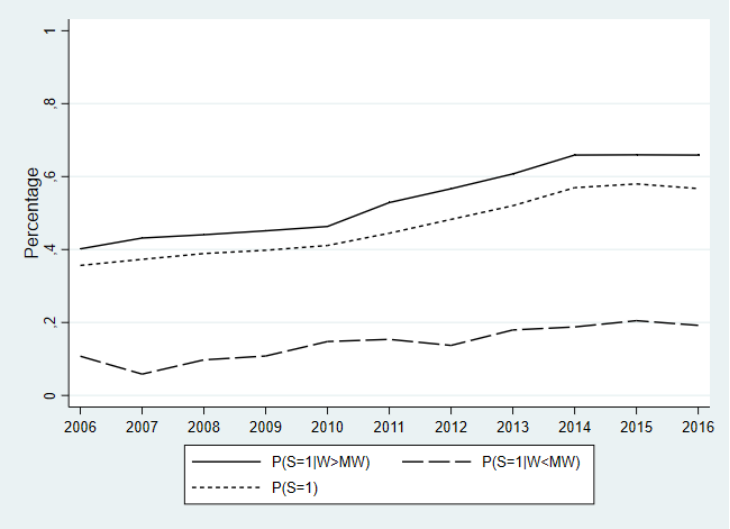
Notes: The sample corresponds to women employed in the domestic sector, 18 to 69 years old and not retired. The dataset corresponds to the NHS from 2006 to 2016. Point estimates and confidence intervals at 90%. Although it can be observed probability results greater than 1 and less than 0, in those cases the results are not significant.

7.1.2 Sector mobility effect and enforcement

As it is shown in the section above, the MW policy has had negative effects on formality (π_d^1). Nevertheless, in the period under review there is a substantial increase in the proportion of women that contribute to social security in the economy in general and in the domestic sector in particular. In this section we analyse whether these findings come into contradiction.

Figure **5** presents the evolution of the probability of being employed in the formal domestic sector by wage level, showing that the probability of being formal for those workers below the MW is small and does not present substantive changes in the analysed period. On the other hand, workers above the MW presents higher levels of formality and the rate increases substantially, explaining the increase in total formality rate for domestic workers. Thus, as the model estimates are based on the bottom part of wage distribution, these results are consistent with the evolution of formality observed in the domestic work sector.

Figure 5: Conditional probabilities of belonging to the formal sector, by wage level. 2006-2016



Notes: The sample corresponds to all women in the domestic work sector, between 18 and 69 years old and not retired. The dataset corresponds to the NHS from 2006 to 2016. The figure plots the probability of being employed in the domestic formal sector and this probability conditional on the wage level, that is, if the worker earns above or below the minimum wage.

Figure 10 (Annex 4) shows the evolution of the number of inspections and formality in all sectors and in the domestic work. Regarding inspections, they are made by complaint or may be at its own initiative, especially to respect the anonymity of those who make the complaint. Although there is a substantial improvement in the handling of complaints, since previously anonymity was not fully respected, important complexities still remain: when dealing with private homes, it is not possible to enter without a search warrant, so permission is requested to enter or to talk with the domestic worker. In case of finding noncompliance with any of the regulations, there is an intimation to comply in the short term and make the corresponding payments and is charged a fine as a penalty. In case that it is not fulfilled within the established period, the summons is renewed and a new sanction is charged. It is mentioned that in the cases in which the inspection has detected noncompliance and made the summons, the situation was regularized.

It can be seen that the formality in the total economy increased, although it is considerably higher in the domestic sector. In this sector, it is noteworthy that until 2007 there were no inspections, so the first years were key for improving the working conditions, but were not accompanied by such a marked increase in formality. From 2011, after years of implementation of the policy, in which the learning time is already considerable, the inspections rise and the increase in formality deepens.

In this sense, although minimum wage policy by itself could generate adverse results over formality, accompanied by a set of policies, such as labour inspections and awareness campaigns contribute to improve formality and working conditions.

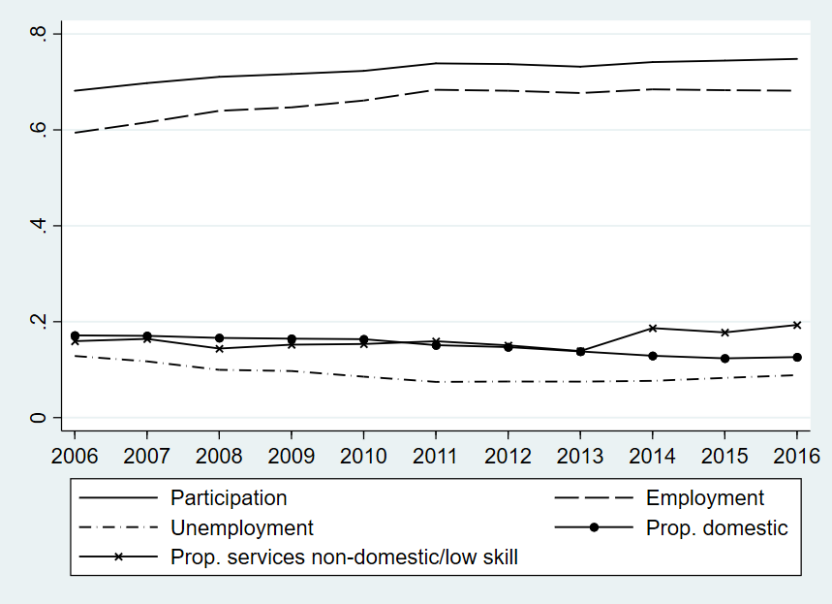
7.1.3 Non employment effect

In this section we study more in depth the evolution over time of the non-employment effect in order to analyse if it is due to unemployment effect or to the shift of workers to other sectors. That is, we want to know if domestic workers who stop working in domestic work sector due to minimum wage policy leave the labour market or are employed in another sector. Given the characteristics of the available data, in this study we cannot analyse labour transitions so we analyse some patterns of change in the cross-section data.

Considering the evolution over time of the main labour market indicators for women in Uruguay, we can see a systematic increase in the participation and employment rate and a decrease in the unemployment rate and in the proportion of women employed in domestic work sector. At the same time, we observe that women with similar characteristics to those employed in domestic work sector (low skill and poor) increase their participation in social services excluding domestic work sector in the analysed period.

These descriptive data provide evidence for the hypothesis that the non-employment effect could be due to the shift of workers to other sectors rather than for undesired effects of the minimum wage on employment. The years of sustained economic growth and the improvement of labour market conditions allow women employed in a historically undervalued sector to shift to other sectors. That is, evidence that indicates employment levels have decreased in the domestic work sector while total employment rate is growing, is consistent with the shift to others sectors hypothesis for the non-employment effect.

Figure 6: Labour market indicator for women, 2006-2016



Notes: The sample corresponds to all women between 18 and 69 years old and not retired. The dataset corresponds to the NHS from 2006 to 2016. The figure plots the participation, employment and unemployment rate for women, the proportion of women employed in domestic work sector and the proportion of low skill women employed in social services but not domestic work sector.

7.2 Heterogeneous effects

After analysing the effects of the minimum wage over wages and employment, it is interesting to analyse these results considering some characteristics of the people that could implicate heterogeneous effects of the policy. In this section we analyse the effects of the policy considering the region of residence, age, presence of children under 18 years old in the household, years of education and ethnicity.

The model estimates by educational level and ethnicity are not statistically significant if we compare each group so we don't analyse those results, although are presented in Table 10.

Regarding region of residence, we analyse the effects of the policy considering three regions: Montevideo (capital city), other urban localities greater than 5000 inhabitants and localities smaller than 5000 inhabitants and rural areas. It can be seen that in Montevideo the parameter associated with non-employment in domestic work sector (π_u) is higher than in the other regions. This can be due to a higher labour supply in the capital city that is associated with greater labour mobility. It is noteworthy that the mass of affected workers ($F_0(m)$) is lower in Montevideo, which may be associated with the fact that many of the workers earn above the MW. In turn, non-compliance is lower in the capital city.

Results are also significantly different if we consider the age of the people. It can be seen that for women 35 years or less the probability of continuing receiving a wage below the minimum after the policy is greater, in particular, there is a high shift of workers from the formal to the informal sector (π_d^1). These results can be associated to the fact that young workers have a particular insertion in this sector, being employed mainly in the care of children and conceiving work as a source of temporary income but with no interest in the future benefits associated with formalization.

Finally, results are analysed according to the presence of children under 18 years of age at household. This analysis could be interesting since households with children are more likely to be low income households and, therefore, target population of different policies that may have tension with the minimum wage. It can be seen that for the workers who live in household with children under 18, there is a lower probability of non-employment (π_u) and a higher probability of maintain a domestic work both complying (π_m) and not complying (π_d) with the MW policy. It could be that women in households without children have more incentive to take the risk of being unemployed and look for employment in other sectors with better working conditions. Non-compliance for formal workers (π_d^1) are higher for women in households with children and so sector mobility is higher for this group.

8 Conclusions and policy implications

The goal of this paper was to contribute with the growing literature on the effects of minimum wage in developing countries with high levels of informal workers by focusing in the domestic work sector. We estimate the impact of the MW over wages, unemployment, and formal-informal sector mobility for women in a feminized sector with high levels of informality: the case of domestic workers in Uruguay. Although these results are relevant for the analysis of minimum wage policies, it is necessary to consider the limits of their external validity. In this sense, it is relevant to take into account that the domestic sector in Uruguay does not present the same characteristics as this sector in other countries, in which it is a more precarious sector, with a higher hourly load and where the live-in regime prevails. Given the sector under analysis in the Uruguayan context, the results of this paper may be valid for highly feminized sectors, with high informality and little regulation prior to the implementation of the minimum wage, as well as weak union bargaining power.

Results indicate significate effects of the MW. 20% of women in domestic work sector were affected by the policy since they are below the established MW. Between them, almost 20% comply with the policy and

increase their wages to reach the MW. On the other hand, employment in the domestic sector decreases approximately 3%, although secondary evidence suggest this would be due to the shift of workers to other sectors and not to unemployment effect. However, this was possible due to the period of growth and improvement of working conditions and not to the MW policy itself. We also find a high sector mobility, 64.5% of affected formal workers maintain the wage below the minimum and therefore migrate to the informal sector. Based on administrative data, we found this non-desire effect seems to be offset by the others labour policies applied in the period such as labour inspections and awareness campaigns. Finally, we found that 33.6% of the affected informal workers increase their wages to reach the MW, although remaining in the informal sector. This is consistent with the lighthouse effect according to which the MW applied in the formal sector also acts as a signal for wage setting in the informal sector.

Analysing the evolution over time, we observe a significant decrease of the probability of compliance and an increase in the probability of non-employment between 2006 and 2016. A hypothesis is that in a context of economic growth and improvement in labour conditions, women in domestic work sector prefer to be unemployed or employed in other sector than maintain the wage below the minimum in the domestic sector. This could be particularly true for the formal workers who may decide between shift to informal sector and lose all the benefits of social security or look for a job in other sector. In fact, the probability of non-compliance for formal domestic workers –sector mobility- decreases substantially in the analysed period.

We analyse possible heterogeneous effects of the policy by demographic and economic characteristics of the worker. Results indicate no significant differences by educational level or ethnicity. Analysing separately for women in households with or without children under 18 years old, we found higher non-employment effects for women in households with children and this could be due to greater need to take the risk of being unemployed and look for better paid employments. We also found higher non-employment effects in capital city workers possibly due to higher opportunities to look for employment in other sectors with better working conditions. Results are also significantly different if we consider the age, there is a high sector mobility for younger women which could be associated with little interest or myopia on the future benefits associated with formalization and social security coverage.

In summary, this study provides evidence on the importance of minimum wages to establish decent wage floors with little non-employment effect. However, it has had non-desire effects over formality that seem to be mitigated due to the implementation of inspection and awareness campaigns. In this context, this study highlights the importance of applying broad labour policies that include both minimum wages and inspection of labour conditions to ensure desire effects of the policy.

We expect these findings to contribute in better evidence based policies for highly feminized and informalized working sectors in developing countries. Particularly for the Uruguayan case, the improvement in the design of this labour policy could be key in a context of employment growth in care services due to the recent creation of a National Care System in Uruguay, since it is precisely a highly feminized and informal sector.

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Annex

Annex 1: McCrary test of discontinuity

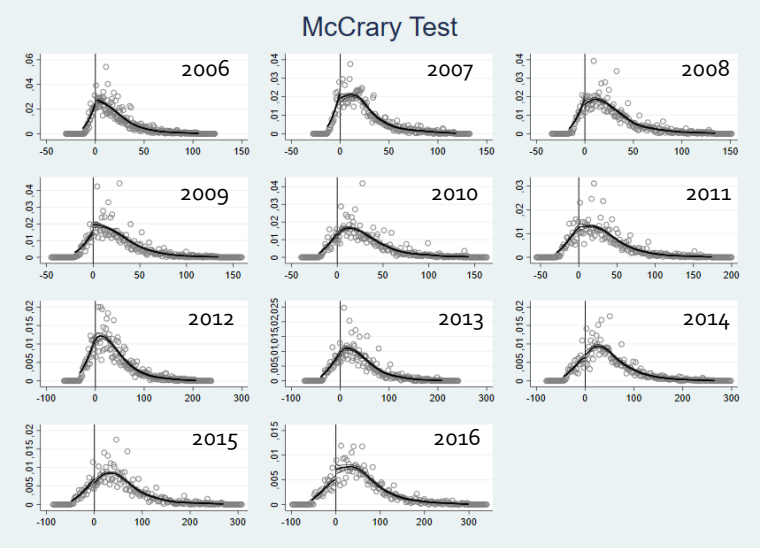
One of key identifying condition in using Jales' (2017) methodology is the discontinuity of wages around the MW. Following McCrary (2008) we analyse the continuity of wages around the MW using a local linear density estimator. We conduct this test for every year and for total, formal and informal workers separately, with wages normalized to the MW. Our main variable is the difference between net hourly wages and MW and the breakpoint analysed is zero. The null hypothesis of no discontinuity is rejected at 10% of confidence for the majority of years in the case of total workers, but not for formal and informal workers separately.

Table 5: Statistics of McCrary test. Hourly wages of formal, informal and total domestic workers around the MW, 2006-2016.

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Pool
Total workers	theta	0.105	-0.156	-0.202	0.225	-0.125	-0.002	-0.028	0.005	0.067	-0.229	0.342	0.065
	se	0.055	0.085	0.085	0.074	0.099	0.085	0.086	0.093	0.109	0.116	0.114	0.025
	pvalue	0.057	0.069	0.017	0.002	0.206	0.977	0.746	0.961	0.538	0.049	0.003	0.009
	binsize	0.47	0.71	0.79	0.79	0.90	1.08	1.32	1.39	1.71	1.94	2.16	0.36
	bandwith	16.79	14.77	17.77	24.95	19.38	26.00	32.38	32.31	35.49	37.52	41.13	23.33
	N	7,273	4,352	4,398	4,122	3,986	3,989	3,586	3,598	3,477	3,050	2,990	44,821
Formal workers	theta	0.295	-0.833	-0.631	0.428	-0.361	0.203	0.210	0.149	-0.067	-0.202	0.330	0.526
	se	0.185	0.475	0.401	0.248	0.348	0.247	0.258	0.237	0.272	0.254	0.261	0.059
	pvalue	0.110	0.079	0.116	0.084	0.300	0.411	0.416	0.528	0.805	0.428	0.205	0.000
	binsize	0.80	1.18	1.25	1.23	1.37	1.57	1.87	1.89	2.19	2.45	2.75	0.56
	bandwith	11.11	10.72	13.12	14.70	14.06	18.56	21.77	25.62	27.28	32.97	30.67	29.39
	N	2,589	1,623	1,724	1,661	1,683	1,751	1,717	1,857	1,957	1,761	1,684	20,007
Informal workers	theta	0.027	-0.057	-0.024	0.178	0.026	-0.085	-0.166	-0.064	0.020	-0.247	0.170	-0.004
	se	0.060	0.074	0.073	0.076	0.083	0.081	0.090	0.090	0.096	0.103	0.113	0.029
	pvalue	0.656	0.442	0.745	0.020	0.759	0.295	0.067	0.479	0.833	0.017	0.132	0.902
	binsize	0.55	0.80	0.94	0.98	1.13	1.38	1.71	1.86	2.46	2.89	3.09	0.42
	bandwith	16.74	20.95	26.46	27.83	29.74	34.26	36.20	42.53	53.95	60.94	55.37	20.84
	N	4,684	2,729	2,674	2,461	2,303	2,238	1,869	1,741	1,520	1,289	1,306	24,814

Notes: The sample corresponds to all women, 14 years or older employed in the domestic sector. The dataset corresponds to the NHS from 2006 to 2016.

Figure 7: McCrary graph test of wages of domestic workers around the minimum wage, 2006-2016.



Notes: The sample corresponds to all women employed in the domestic sector, between 18 and 69 years old and not retired. The dataset corresponds to the NHS from 2006 to 2016.

Table 6: McCrary test of discontinuity on wages for total domestic workers at different points, 2006-2016.

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Pool
Brekpoint (25)	theta	-0.106	-0.197	-0.240	0.106	0.092	-0.026	-0.065	-0.137	0.066	0.063	-0.019	-0.040
	se	0.070	0.084	0.071	0.077	0.075	0.069	0.074	0.071	0.068	0.073	0.086	0.028
	pvalue	0.127	0.019	0.001	0.169	0.219	0.702	0.382	0.053	0.328	0.389	0.826	0.157
	binsize	0.47	0.71	0.79	0.79	0.90	1.08	1.32	1.39	1.71	1.94	2.16	0.36
	bandwith	18.27	18.98	27.26	24.81	26.88	36.13	38.14	44.89	55.06	60.66	53.28	19.87
	N	7,273	4,352	4,398	4,122	3,986	3,989	3,586	3,598	3,477	3,050	2,990	44,821
Brekpoint (40)	theta	-0.084	-0.046	0.010	0.156	-0.125	-0.051	0.043	-0.208	-0.074	0.083	-0.158	0.002
	se	0.105	0.121	0.101	0.102	0.091	0.085	0.091	0.077	0.080	0.083	0.080	0.034
	pvalue	0.425	0.706	0.923	0.125	0.169	0.548	0.636	0.007	0.354	0.318	0.048	0.960
	binsize	0.47	0.71	0.79	0.79	0.90	1.08	1.32	1.39	1.71	1.94	2.16	0.36
	bandwith	19.37	20.72	22.56	26.74	29.50	33.72	36.17	48.04	42.98	47.75	58.51	22.26
	N	7,273	4,352	4,398	4,122	3,986	3,989	3,586	3,598	3,477	3,050	2,990	44,821
Brekpoint (50)	theta	0.079	0.199	-0.157	0.398	0.373	-0.052	-0.235	0.089	0.062	-0.197	-0.012	0.099
	se	0.139	0.162	0.123	0.132	0.119	0.099	0.097	0.093	0.088	0.081	0.087	0.038
	pvalue	0.572	0.222	0.203	0.002	0.002	0.599	0.015	0.335	0.484	0.015	0.891	0.010
	binsize	0.47	0.71	0.79	0.79	0.90	1.08	1.32	1.39	1.71	1.94	2.16	0.36
	bandwith	17.23	19.46	28.80	24.93	26.40	35.56	40.84	41.12	41.88	54.97	53.38	23.88
	N	7,273	4,352	4,398	4,122	3,986	3,989	3,586	3,598	3,477	3,050	2,990	44,821

Notes: The sample corresponds to all women employed in the domestic sector, between 18 and 69 years old and not retired. The dataset corresponds to the NHS from 2006 to 2016.

Table 7: McCrary test of discontinuity on wages for total domestic workers using different binsize.

	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
theta	0.066	0.082	0.098	0.106	0.134	0.150	0.142	0.145	0.151	0.172
se	0.025	0.025	0.024	0.024	0.024	0.023	0.023	0.023	0.023	0.023
pvalue	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: The sample corresponds to all women employed in the domestic sector, between 18 and 69 years old and not retired. The dataset corresponds to the pooled NHS from 2006 to 2016.

Annex 2: Independence test between sector and wages

Figure 8 y Table 8 shows evidence that validates the hypothesis of independence between sector and wages. Figure 8 shows graphical evidence that the formality rate does not vary significantly above the minimum wage level. Table 8 shows the results for a linear regression of formality over wages for domestic workers above the minimum wage level. The coefficient of the relationship of formality and wages tend to decrease once we condition on higher wages, and the level of significance turns lower.

Figure 8: Non parametric analysis of formality vs. wages

Notes: The sample corresponds to all women employed in the domestic sector, between 18 and 69 years old and not retired. The dataset corresponds to the NHS from 2006 to 2016. Black lines indicate the minimum wage level in each year.

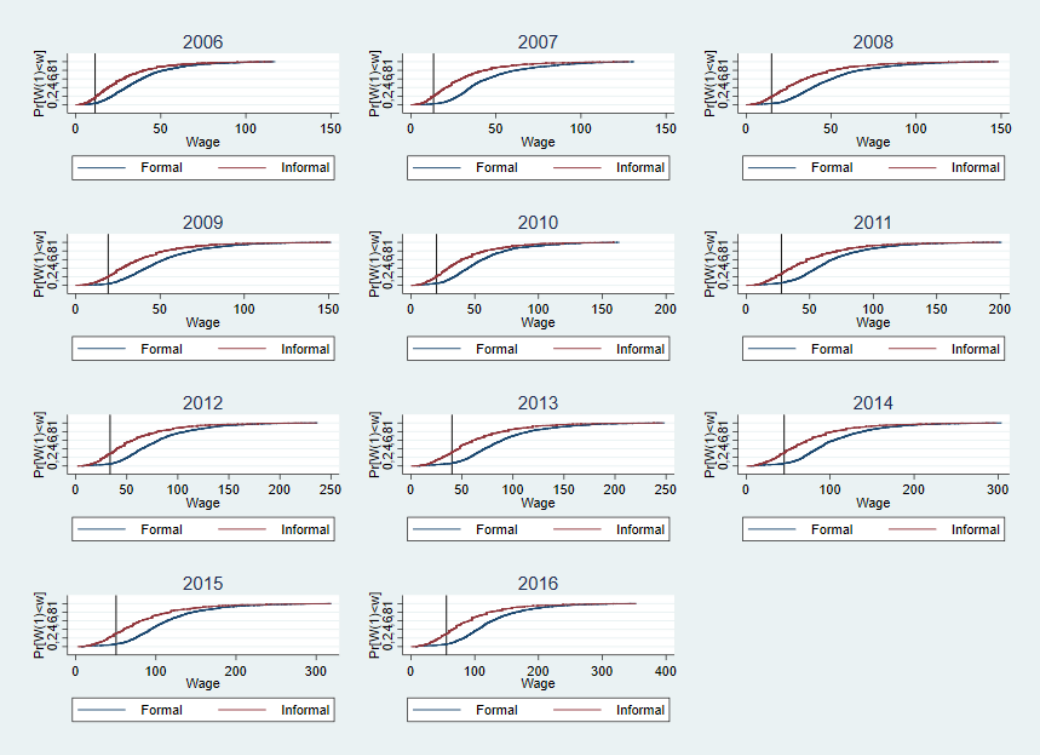
Table 8: Parametric linear regression of formality vs. wages

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
W > 0	0.0025	0.0033	0.0028	0.0028	0.0027	0.0025	0.0026	0.0028	0.0024	0.0023	0.0025
pval	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
W > m	0.0018	0.0026	0.0022	0.0020	0.0021	0.0015	0.0016	0.0017	0.0014	0.0012	0.0016
pval	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
W > 1.5m	0.0012	0.0017	0.0014	0.0011	0.0012	0.0005	0.0006	0.0004	0.0004	0.0002	0.0005
pval	0.0000	0.0000	0.0000	0.0000	0.0000	0.0327	0.0079	0.0863	0.0428	0.3080	0.0193
W > 2m	0.0008	0.0010	0.0008	0.0006	0.0004	0.0001	0.0002	0.0000	0.0002	-0.0001	0.0001
pval	0.0001	0.0000	0.0003	0.0396	0.1040	0.7160	0.4720	0.9530	0.4350	0.6630	0.6670

Notes: The sample corresponds to all women employed in the domestic sector, between 18 and 69 years old and not retired. The dataset corresponds to the NHS from 2006 to 2016.

Annex 3: Data and descriptive analysis

Figure 9. Empirical Cumulative Distribution Function of Wages



Notes: The sample corresponds to all women employed in the domestic sector, between 18 and 69 years old and not retired. The dataset corresponds to the NHS from 2006 to 2016.

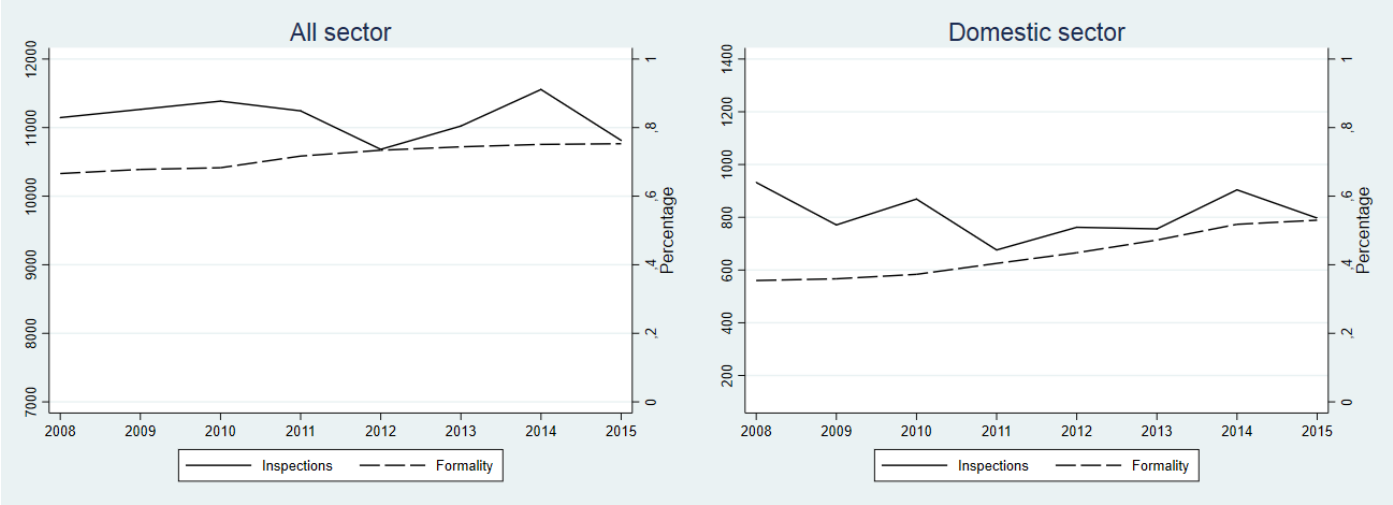
Annex 4: Estimation

Table 9: Model parameter estimates, 2006-2016 and pooled data

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Pool
π_d	0.636***	0.816***	0.680***	0.601***	0.590***	0.717***	0.656***	0.580***	0.609***	0.519***	0.552***	0.654***
	(0.032)	(0.041)	(0.038)	(0.036)	(0.036)	(0.046)	(0.038)	(0.040)	(0.039)	(0.068)	(0.035)	(0.013)
π_m	0.327***	0.250***	0.242***	0.164***	0.195***	0.193***	0.148***	0.143***	0.174***	0.172***	0.127***	0.192***
	(0.025)	(0.021)	(0.024)	(0.013)	(0.021)	(0.019)	(0.016)	(0.016)	(0.016)	(0.032)	(0.013)	(0.006)
π_u	0.038	-0.066	0.078	0.235***	0.214***	0.090	0.196***	0.277***	0.217***	0.309***	0.320***	0.153***
	(0.043)	(0.053)	(0.049)	(0.041)	(0.045)	(0.058)	(0.046)	(0.044)	(0.046)	(0.053)	(0.039)	(0.017)
$F_0(m)$	0.163***	0.150***	0.159***	0.193***	0.195***	0.229***	0.229***	0.258***	0.231***	0.238***	0.251***	0.202***
	(0.004)	(0.004)	(0.005)	(0.006)	(0.006)	(0.006)	(0.007)	(0.009)	(0.007)	(0.011)	(0.009)	(0.002)
π_d^1	0.806***	1.105***	0.763***	0.425***	0.487***	0.762***	0.600***	0.487***	0.617***	0.462***	0.454***	0.645***
	(0.104)	(0.122)	(0.110)	(0.093)	(0.097)	(0.109)	(0.078)	(0.071)	(0.068)	(0.078)	(0.058)	(0.031)
π_m^1	0.101***	0.048***	0.060***	0.053***	0.050***	0.066***	0.052***	0.054***	0.053***	0.066***	0.051***	0.063***
	(0.018)	(0.014)	(0.014)	(0.010)	(0.012)	(0.012)	(0.013)	(0.010)	(0.010)	(0.014)	(0.010)	(0.004)
π_d^0	0.521***	0.596***	0.616***	0.745***	0.679***	0.669***	0.728***	0.722***	0.595***	0.628***	0.732***	0.664***
	(0.040)	(0.036)	(0.041)	(0.025)	(0.039)	(0.035)	(0.033)	(0.034)	(0.042)	(0.080)	(0.030)	(0.011)
π_m^0	0.479***	0.404***	0.384***	0.255***	0.321***	0.331***	0.272***	0.278***	0.405***	0.372***	0.268***	0.336***
	(0.040)	(0.036)	(0.041)	(0.025)	(0.039)	(0.035)	(0.033)	(0.034)	(0.042)	(0.080)	(0.030)	(0.011)
Λ	0.402***	0.431***	0.439***	0.450***	0.463***	0.522***	0.562***	0.603***	0.657***	0.655***	0.648***	0.526***
	(0.008)	(0.008)	(0.009)	(0.009)	(0.010)	(0.010)	(0.011)	(0.009)	(0.010)	(0.010)	(0.010)	(0.003)
Obs.	7,273	4,352	4,398	4,122	3,986	3,989	3,586	3,598	3,477	3,050	2,990	44,821

Notes: The sample corresponds to women employed in the domestic sector, 18 to 69 years old and not retired. The dataset corresponds to the NHS from 2006 to 2016. Standard errors in parentheses computed by 100 bootstrap replications. *** p<0.01, ** p<0.05, * p<0.1

Figure 10: Labour inspections carried out by the SSI and evolution of formality. 2008-2015



Notes: The sample corresponds to all women employed in the domestic sector, between 18 and 69 years old and not retired. The dataset used to calculate the formality corresponds to the NHS from 2006 to 2016. The inspection data are from the SSI.

Table 10: Heterogeneity analysis. Estimation of parameters by variables of interest.

	Region			Age		Child. in household		Years of education		Ethnicity		Pool
	Capital city	More than 5000 hab	Less than 5000 hab	35 or less	More than 35	No	Yes	Less than 7 years	7 years or more	Non-afro	Afro	
π_d	0.423***	0.705***	0.640***	0.776***	0.577***	0.567***	0.679***	0.654***	0.618***	0.645***	0.653***	0.654***
	(0.019)	(0.016)	(0.034)	(0.026)	(0.015)	(0.018)	(0.019)	(0.020)	(0.018)	(0.014)	(0.033)	(0.013)
π_m	0.105***	0.217***	0.184***	0.206***	0.180***	0.168***	0.199***	0.197***	0.177***	0.197***	0.150***	0.192***
	(0.008)	(0.008)	(0.016)	(0.011)	(0.007)	(0.008)	(0.008)	(0.010)	(0.008)	(0.007)	(0.013)	(0.006)
π_u	0.472***	0.078***	0.176***	0.018	0.243***	0.265***	0.122***	0.149***	0.205***	0.158***	0.196***	0.153***
	(0.023)	(0.020)	(0.042)	(0.032)	(0.018)	(0.022)	(0.023)	(0.026)	(0.022)	(0.017)	(0.038)	(0.017)
$F_0(m)$	0.160***	0.235***	0.257***	0.237***	0.193***	0.209***	0.206***	0.215***	0.200***	0.201***	0.220***	0.202***
	(0.005)	(0.003)	(0.006)	(0.004)	(0.002)	(0.004)	(0.003)	(0.003)	(0.003)	(0.002)	(0.005)	(0.002)
π_d^1	0.137***	0.770***	0.599***	0.893***	0.505***	0.488***	0.685***	0.643***	0.562***	0.640***	0.541***	0.645***
	(0.039)	(0.039)	(0.077)	(0.073)	(0.031)	(0.037)	(0.045)	(0.049)	(0.041)	(0.031)	(0.077)	(0.031)
π_m^1	0.032***	0.071***	0.073***	0.064***	0.062***	0.052***	0.069***	0.064***	0.059***	0.063***	0.062***	0.063***
	(0.005)	(0.005)	(0.010)	(0.007)	(0.004)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.010)	(0.004)
π_d^0	0.799***	0.642***	0.687***	0.688***	0.669***	0.675***	0.674***	0.664***	0.685***	0.650***	0.763***	0.664***
	(0.018)	(0.014)	(0.034)	(0.019)	(0.014)	(0.017)	(0.013)	(0.018)	(0.016)	(0.013)	(0.023)	(0.011)
π_m^0	0.201***	0.358***	0.313***	0.312***	0.331***	0.325***	0.326***	0.336***	0.315***	0.350***	0.237***	0.336***
	(0.018)	(0.014)	(0.034)	(0.019)	(0.014)	(0.017)	(0.013)	(0.018)	(0.016)	(0.013)	(0.023)	(0.011)
Λ	0.568***	0.491***	0.538***	0.428***	0.562***	0.575***	0.493***	0.510***	0.539***	0.531***	0.495***	0.526***
	(0.005)	(0.004)	(0.008)	(0.006)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.007)	(0.003)
Obs.	15,015	23,458	6,348	12,899	31,922	17,804	27,017	21,071	23,750	38,563	6,258	44,821

Notes: The sample corresponds to all women employed in the domestic sector, between 18 and 69 years old and not retired. The dataset corresponds to the NHS from 2006 to 2016. Standard errors in parentheses computed by 100 bootstrap replications. *** p<0.01, ** p<0.05, * p<0.1

Annex 5: Robustness check for estimation

Table 11: Different choices of bandwidth.

	4			5			6			7			8		
	Estim.	LL	UL	Estim.	LL	UL	Estim.	LL	UL	Estim.	LL	UL	Estim.	LL	UL
π_d	0.731***	0.694	0.769	0.713***	0.675	0.750	0.693***	0.656	0.731	0.673***	0.636	0.711	0.654***	0.617	0.692
π_m	0.215***	0.201	0.228	0.209***	0.196	0.223	0.204***	0.190	0.217	0.198***	0.184	0.212	0.192***	0.179	0.206
π_u	0.054*	0.006	0.102	0.078***	0.030	0.126	0.103***	0.055	0.151	0.129***	0.081	0.177	0.153***	0.105	0.201
$F_0(m)$	0.184***	0.177	0.192	0.188***	0.181	0.196	0.193***	0.185	0.200	0.197***	0.190	0.205	0.202***	0.194	0.209
π_d^1	0.827***	0.739	0.915	0.783***	0.695	0.871	0.737***	0.649	0.825	0.690***	0.602	0.778	0.645***	0.558	0.733
π_m^1	0.071***	0.062	0.079	0.069***	0.060	0.077	0.067***	0.059	0.075	0.065***	0.057	0.073	0.063***	0.055	0.071
π_d^0	0.625***	0.601	0.649	0.635***	0.610	0.659	0.645***	0.620	0.669	0.655***	0.630	0.679	0.664***	0.640	0.689
π_m^0	0.375***	0.351	0.399	0.365***	0.341	0.390	0.355***	0.331	0.380	0.345***	0.321	0.370	0.336***	0.311	0.360
Λ	0.526***	0.521	0.530	0.526***	0.521	0.530	0.526***	0.521	0.530	0.526***	0.521	0.530	0.526***	0.521	0.530
Obs.	44,821			44,821			44,821			44,821			44,821		

Notes: The sample corresponds to all women employed in the domestic sector, between 18 and 69 years old and not retired. The dataset corresponds to the NHS from 2006 to 2016. Standard errors in parentheses computed by 100 bootstrap replications. *** p<0.01, ** p<0.05, * p<0.1. In the table the estimates parameters for the pooled data using different choices of bandwidth are presented. Each column shows the times that the Silverman´s rule of thumb was applied. In the estimation of the model we consider 8 times.

Table 12: Different choices of fraction at MW and kernel density point estimation.

	a=0.05,b=0.06			a=0.05,b=0.05			a=0.05,b=0.07			a=0.04,b=0.06			a=0.06,b=0.06		
	Estimation	LL	UL	Estimation	LL	UL	Estimation	LL	UL	Estimation	LL	UL	Estimation	LL	UL
π_d	0.654***	0.617	0.692	0.665***	0.628	0.703	0.644***	0.606	0.681	0.677***	0.639	0.714	0.629***	0.592	0.667
π_m	0.192***	0.179	0.206	0.196***	0.182	0.209	0.189***	0.176	0.203	0.156***	0.143	0.170	0.248***	0.234	0.261
π_u	0.153***	0.105	0.201	0.139***	0.091	0.187	0.167***	0.119	0.215	0.167***	0.119	0.215	0.123***	0.075	0.171
$F_0(m)$	0.202***	0.194	0.209	0.199***	0.192	0.207	0.204***	0.197	0.212	0.201***	0.193	0.208	0.203***	0.195	0.210
π_d^1	0.645***	0.558	0.733	0.671***	0.583	0.759	0.620***	0.532	0.708	0.631***	0.544	0.719	0.690***	0.602	0.778
π_m^1	0.063***	0.055	0.071	0.064***	0.056	0.073	0.062***	0.054	0.070	0.051***	0.042	0.059	0.077***	0.069	0.086
π_d^0	0.664***	0.640	0.689	0.659***	0.635	0.683	0.670***	0.646	0.694	0.727***	0.703	0.751	0.561***	0.537	0.586
π_m^0	0.336***	0.311	0.360	0.341***	0.317	0.365	0.330***	0.306	0.354	0.273***	0.249	0.297	0.439***	0.414	0.463
Λ	0.526***	0.521	0.530	0.526***	0.521	0.530	0.526***	0.521	0.530	0.525***	0.520	0.529	0.528***	0.524	0.533
Obs.	44,821			44,821			44,821			44,821			44,821		

Notes: The sample corresponds to all women employed in the domestic sector, between 18 and 69 years old and not retired. The dataset corresponds to the NHS from 2006 to 2016. Standard errors in parentheses computed by 100 bootstrap replications. *** p<0.01, ** p<0.05, * p<0.1. *a* corresponds to the factor that multiplies the standard deviation to calculate the fraction that earns the MW. *b* is the factor that multiplies the deviation to determine the values in which the estimation of the kernel density is made.

Table 13: Estimations rounding wages at different heaping points

	25			50			75			100		
	Estimation	LL	UL	Estimation	LL	UL	Estimation	LL	UL	Estimation	LL	UL
π_d	0.655***	0,634	0,677	0.656***	0,634	0,678	0.654***	0,633	0,675	0.652***	0,631	0,673
π_m	0.192***	0,182	0,203	0.192***	0,181	0,202	0.195***	0,184	0,205	0.191***	0,181	0,201
π_u	0.152***	0,124	0,181	0.152***	0,123	0,181	0.151***	0,123	0,179	0.157***	0,130	0,185
$F_0(m)$	0.202***	0,198	0,206	0.202***	0,198	0,206	0.202***	0,198	0,206	0.202***	0,198	0,206
π_d^1	0.647***	0,596	0,699	0.648***	0,595	0,700	0.651***	0,600	0,702	0.638***	0,588	0,689
π_m^1	0.063***	0,056	0,070	0.063***	0,056	0,070	0.062***	0,055	0,070	0.062***	0,055	0,070
π_d^0	0.664***	0,646	0,683	0.665***	0,647	0,684	0.658***	0,640	0,677	0.667***	0,649	0,685
π_m^0	0.336***	0,317	0,354	0.335***	0,316	0,353	0.342***	0,323	0,360	0.333***	0,315	0,351
Λ	0.526***	0,521	0,530	0.526***	0,521	0,530	0.526***	0,521	0,530	0.525***	0,521	0,530
Obs.	44,821			44,821			44,821			44,821		

Notes: The sample corresponds to all women employed in the domestic sector, between 18 and 69 years old and not retired. The dataset corresponds to the NHS from 2006 to 2016. *** p<0.01, ** p<0.05, * p<0.1 computed by 100 bootstrap replications. We estimate the parameters by rounding the total wage to the nearest multiple of 25, 50, 75 and 100.