Minimum Wages and Firm Dynamics: Evidence From Costa Rica's Occupation-Based System

Jonathan Garita*

April 25, 2021

[Updated Frequently. Click here for latest version]

Abstract

This paper analyzes the firm dynamics of adjustment to higher minimum wages using Costa Rica's occupation-specific minimum wage setting. To this purpose, I assemble rich administrative data covering the universe of workers and firms in the 2006-2017 period to construct firm-level measures of compliance cost, and estimate the impact of differential exposure to the minimum wage on firm outcomes at several year horizons. The analysis yields two important results: First, minimum wages induce firms to increase their labor shares, but with a negative and persistent impact on their profitability. The positive effect on the labor shares moderates as firms reduce their employment levels and expand their capital stocks. Second, raising minimum wages has a detrimental impact on aggregate employment dynamics by reducing firm entry, with an estimated adverse effect on employment of 0.8 percent due to the missing entrants associated with the policy.

JEL Codes: D24, J23,J24, J31, J38, O14

*University of Texas at Austin (jgth24@utexas.edu). I am grateful to Ayşegül Şahin, Andreas I. Mueller, and Stephen Trejo for invaluable support and helpful discussions. I also thank the comments and suggestions from Daniel Ackerberg, Daniel Hamermesh, Christoph Boehm, Richard Murphy, Marcela Eslava, Sadhika Bagga, participants in the UT Austin Macro seminar, UT Development, Labor and Public seminar, University of Los Andes, University of Oklahoma, and other conferences. I gratefully acknowledge the Central Bank of Costa Rica (BCCR) and its Economic Research Department for all the support with the data access. All results have been reviewed by BCCR to ensure that no confidential information is disclosed. All errors are my own.

1 Introduction

The minimum wage is a central public policy implemented to protect low-paid workers and reduce income inequality. More recently, many countries are discussing legislation to raise minimum wage levels based on an active body of research pointing out a positive impact on diverse worker outcomes with apparently non-existent employment consequences. Nevertheless, raising minimum wages distorts firm-level input choices and business entry and exit decisions. Given the relative importance of firms in the aggregate economy, it is crucial to consider the policy's effects on these margins to evaluate the trade-offs and the macroeconomic impact.

Firm-level analysis requires sufficiently large and persistent minimum wage increases.[1] If minimum wages are set low relative to local wages or increases are small and phased in over a long period, firms may be willing to accept lower profits without making adjustments in their production process as they perceive a transitory and modest cost shock. Then, a lack of a significant or muted response in primary margins, such as employment, may reflect a low-binding minimum wage policy.[2] Extrapolating information on how firms absorb higher minimum wages from countries with a low-binding policy to economies with a restrictive context is problematic, explaining the contentious debate that persists around the policy until today.

This paper estimates the effects of minimum wages on different margins of firm and employment dynamics, examining Costa Rica's labor market between 2006 and 2017. This country represents the case of an economy with a highly binding policy. The minimum wage relative to the median wage in this country is of 70 percent, significantly above the OECD averages (60 percent) and the U.S. (40 percent). Additionally, Costa Rica establishes minimum wages across different occupations, not only specific low-skilled groups. Hence, a policy change extends to the entire labor market segment and not only specific industries or demographics. Moreover, the country experienced sizeable and frequent minimum wage increases. Between 2006 and 2017, minimum wages rose in nominal terms by more than 100 percent and in real terms by 20 percent. Finally, Costa Rica offers extensive and granular administrative data to connect and track the universe of workers and firms. All these elements place Costa Rica in an advantageous position to discuss the

[1]By persistent, I refer to changes in the real value of the minimum wage that stays over time. As discussed by Stigler (1946); Sorkin (2015), nominal rises that are temporary due to inflation and rising real wages are unpromising to detect longer-term responses. Such is the case of countries where minimum wage increases are phased out over several years and not indexed to past inflation rates.

[2]The U.S. literature, in particular, has consistently found limited impact on firms (e.g., Cengiz et al. (2019), Chen (2019)). However, the inflation-adjusted minimum wage levels in this country have consistently deteriorated since 1968.

trade-offs associated with minimum wages.

Specifically, the purpose of the paper is twofold. First, I investigate the minimum wage effects on the labor share, defined as the proportion of value-added paid to workers through wages. The global decline in the labor share (Karabarbounis and Neiman, 2014) has raised concerns about expanding inequality, wage stagnation, and a decline in consumer purchasing power. A large and growing strand of research has extensively evaluated the relative importance of various factors shaping the evolution of the labor share. Blanchard and Giavazzi (2003); Piketty (2015); **?** stress the importance of labor market regulation and minimum wage policies both as factors and possible solutions to revert its decline. However, little is known about the minimum wage's effectiveness in inducing firms to increase their labor shares. Higher minimum wages boost the workers' bargaining power and push firms to raise their wage rates (Flinn, 2006). Yet, the potential displacement effects and capital-labor substitution associated with the policy could also outweigh the positive impact, especially in the longer run. The final result is, ultimately, an empirical question that I address in this research. Moreover, by focusing on this variable, I can speak about relevant margins such as employment, capital-labor substitution, productivity, and profitability.

Second, the chapter analyzes the effect of higher minimum wages on firm entry and the implications for aggregate employment dynamics. The empirical evidence on this margin is mixed and inconclusive. For instance, studies using accurate methods have shown no significant impact on firm creation (e.g., Giupponi and Machin (2018); Harasztosi and Lindner (2019); Jardim and Van Inwegen (2019)) and even a positive effect in restaurant entry after a minimum wage increase (e.g., Aaronson et al. (2018)). As I show later, I document significant and persistent adverse effects on entry. As stressed by Haltiwanger et al. (2013); Decker et al. (2014); Karahan et al. (2019); Pugsley and Şahin (2019), a lower rate of business startups or new firms has critical consequences in the pace of employment dynamism. Although young firms exhibit much lower survival rates, those that survive make a substantial contribution to job creation. Then, a decline in the share of employment accounted for by startups has lagged and expanding effects in aggregate employment. I implement a dynamic framework to show that aggregate employment is around 0.8 percent lower due to missing entrants associated with the policy by the end of the analysis. This sizeable effect opposes the small employment adjustment computed on incumbent firms, underlining that minimum wage policies have a substantial and adverse employment effect by deterring startup activity.

I construct a linked employer-employee dataset by processing the universe of monthly social security reports provided by employers between 2006 and 2017. I supplement this

information with the universe of corporate tax declarations comprising annual firm-level balance sheet statements traditionally used to track profitability, capital usage, productivity, and firm revenues. By combining these two sources, I assemble a final dataset adequately suited to analyze the impact of a binding and extensive minimum wage setting on firm behavior.

I estimate a firm-level minimum wage exposure measure using the merged dataset. Specifically, I measure firm-level cost of compliance to the policy, i.e., the increase in the total wage bill that a firm must pay to satisfy the new minimum wage requirements. A one percentage point, for instance, means that the firm has to increase its labor costs by one percent to bring all of its current employees up to the new minimum wage levels. I then exploit variation in the cost of compliance to examine whether differential exposure to the minimum wage leads to differential changes in the relevant firm outcomes at different year horizons. More precisely, I estimate a sequence of local projections based on Jordà (2005) to compute firm outcomes' dynamic responses to minimum wage changes.

To address potential endogeneity issues associated with the minimum wage exposure variable, I exploit that firms are differentially exposed to the common minimum wage adjustments based on their occupational composition. Put differently, I consider an instrument for exposure consisting of the occupation-specific minimum wage increases, weighted by the firm's occupational composition in 2007, based on the shift-share design literature (Adao et al., 2019; Goldsmith-Pinkham et al., 2020; Borusyak et al., 2020). Such a year concludes nearly a decade during which minimum wages were modified to explicitly and exclusively compensate for past CPI growth rates. After 2008, a rapid and dramatic fall in the inflation rates led to a steady and upward trend in the real minimum wage.[3] Finally, I use the computed dynamic responses to construct elasticities at different year horizons, defined as the percentage change in the firm outcome as a result of a one percent increase in the labor costs *induced* by the minimum wage.

The results of my analysis show that increasing the minimum wage induces firms to raise their labor shares. The estimated impact is more pronounced during the first years after the minimum wage change (an elasticity of 0.67). The magnitude decreases as the horizon extends to converge to 0.45. Namely, a one percent increase in the labor costs induced by the minimum wage leads to a rise in the labor shares of 0.45-0.67 percent. Such a pattern reflects firms implementing significant input demand adjustments in response to the policy. More precisely, higher minimum wages lead to disemployment effects and capital-labor substitution. Still, the employment elasticity is relatively small (between 0.09

[3]The cumulative percentage change in the real minimum wage for low-skilled occupations between 1998 and 2007 was 1.9 percent, while the cumulative change between 2008 and 2017 was around 21 percent.

to -0.14), explaining the persistent positive impact of higher minimum wages on the labor share. On the other hand, minimum wages negatively impact firm profitability, stressing the policy's redistributional aspect: higher minimum wages encourage a transfer of rents from firms (lower profits) to workers (higher labor shares). The positive impact on the labor share is observed throughout all occupations, ruling out an effect driven by minimum wages reaching higher-skilled occupations. Using a simple decomposition based on Melitz and Polanec (2015), I estimate the minimum wage effects on the aggregate labor share, taking into account the policy's impact on firm exit and entry. The results suggest that the aggregate labor share between 2007 and 2017 increased between 0.72 and 1.51 percent. Such effect accounts for 21.1 to 44.3 percent of the 2007-2017 increase in Costa Rica's aggregate labor share.

The estimated employment elasticities are remarkably aligned with the most recent literature (Dube (2019a)). Nonetheless, Costa Rica's multi-tier setting could be explaining such a result, as policy exposure through higher-skilled occupations could ameliorate the impact. Yet, I consistently find small elasticities across different skill levels and occupation types. For higher-skilled occupations, I do not detect a significant effect on employment, suggesting that the adjustment takes place for occupations that are more easily substitutable for technology (e.g., low-skilled and routine/manual intensive groups).

Despite the minor adjustment in terms of employment levels, higher minimum wages have a sizeable impact on flows. Exposed firms reduce hiring rates substantially and persistently in response to higher labor costs. Since capital adoption intensifies as the horizon extends, this result means that raising the minimum wage incentivizes firms to expand their production process in terms of capital rather than labor.

Minimum wages have a positive impact on firm exit. However, results suggest that the impact is mostly concentrated on small and low productive firms. Since I document a decline in profitability due to higher minimum wages, the increase in firm exit establishes that firms unable to adapt to higher labor costs are forced to exit the market.

Finally, the minimum wage policy had an adverse impact on startup activity. I aggregate the data to industry levels to conclude that a one percentage point increase in the compliance cost (minimum wage exposure) reduces entry rates (number of age 0 firms or startups as a fraction of the total number of firms) between 0.6 and 1.0 percent. Similarly, startup employment shares (employment at age 0 firms as a fraction of all private sector employment) between 1.6 and 2.6 percent. Hence, the number and the size of new entrants (in terms of employment) decline in response of the policy. I implement a framework of employment dynamics based on Pugsley and Şahin (2019) to quantify the implications of the decline in firm entry on aggregate employment. In this model, the

evolution of employment is a function of incumbent lifecycle dynamics (survival rates and job creation rates across young and mature firms) and startup activity. I construct a counterfactual sequence of employment allocated in startup firms, compensating for the estimated missing entrants induced by the minimum wage policy. Then, conditioning on the observed lifecycle dynamics in the data, I calculate a sequence of aggregate employment that assumes that the minimum wage policy did not reduce firm entry. Results suggest that aggregate employment in Costa Rica is around 0.8 percent lower due to the missing entrants by the end of the analysis. This sizeable effect adds to the slight employment adjustment computed on incumbent firms, underlining that minimum wage policies have a substantial and adverse employment effect by deterring startup activity.

The rest of the paper proceeds as follows. Section 2 describes the salient features of Costa Rica's minimum wage setting. Section 3 describes the data and provides descriptive statistics. Section 4 discusses the paper's empirical strategy, starting with the exposure measures and then the regression analysis. Section 5 presents the estimation results and robustness checks. I start by discussing the main firm-level results to conclude with the dynamic implications of less firm entry on aggregate employment.

2 Institutional Context

2.1 Minimum Wage Structure

The minimum wage policy in Costa Rica is substantially more differentiated than in most of the OECD countries. This country implements a multi-tiered system of legal wage floors that vary by occupation, so minimum wage rates are essentially set by skill level. Adjustments are made twice a year, with new levels becoming effective in January and July, and decisions are carried out by the National Council of Salaries (NCS), a national-level tripartite commission formed of three representatives from labor unions, three from the Chamber of Commerce (private-sector companies) and three from the Central Government. The negotiating process is widely publicized, and the central purpose of the policy is to protect low-wage workers by establishing a wage floor that ensures basic living conditions to these individuals.

Statutory minimum wages legally cover employees in private-sector firms and private households (domestic service), representing, on average between 2010-2015, 61 percent of all workers. The policy excludes self-employment or unpaid family workers (one percent of total workers), independent workers (23 percent of total workers). Although the public sector wages (15 percent of total workers) are established within a distinct framework,

decision-makers fundamentally based their choices on the minimum wage structure and adjustments, primarily since unions represented in the Council overwhelmingly represent public sector workers (OECD, 2017). Moreover, Costa Rica's private-sector has low unionization rates, and collective bargaining over wages and working conditions is limited. According to the (OECD, 2017), the percentage of workers in Costa Rica in a labor union in 2013 is 7%, remarkably below the OECD average (26%) and the U.S. (10.3%). Similarly, collective bargaining agreements cover around 16% of workers in 2013, below the OECD average (49%), and the largest proportion of these agreements are formed in the public sector. Hence the minimum wage policy constitutes the dominant institutional setting shaping the private-sector wage determination.

In 1987, the NCS embarked on a process of gradual simplification of the structure and the decision-making process. There were 520 different industry-occupation categories before such a year, and, from 1995 to the present, there are 24 different minimum wage levels. Specifically, workers are organized into three broad categories. The first group is of occupations associated with the production process (blue-collar workers). The second one, generic, applies to white-collar or administrative occupations. The third one covers specific occupations such as domestic workers and reporters. The first two groups are further divided into four skill categories: unskilled, semi-skilled, skilled, and specialized. Finally, there is an additional legal wage floor for workers with a bachelor's degree (undergraduate diploma) and university graduates (5-year university degree or *Licenciatura*). Table 1 summarizes the most important categories.

Table 1: Costa Rica: Minimum Wages by Skill Groups

	Minimum Wage (Low Skilled=100)	Kaitz Index	Percentage Increase 2006-2017	
			Nominal	CPI-Deflated
Low Skilled	100	0.82	122.8	27.7
Semi Skilled	122	0.77	118.0	25.0
Skilled	127	0.74	113.1	22.1
Technical Low-Skilled	143	0.61	107.3	18.8
Specialized	146	0.67	108.2	19.3
Technical High-Skilled	194	0.68	107.3	18.8
Bachelors University	216	0.55	107.3	18.8
University Graduate	290	0.45	107.3	18.8

Notes: The Kaitz Index is defined as the ratio of minimum wage to median wage. The monthly minimum wage for a low skilled worker in 2020 is 316,965 CRC, approximately US$560.
Source: Ministry of Labor and Social Security (MTSS)

2.2 Adjustment Process and Time Behavior

In 1998 the Central Government and the NCS agreed on adjusting the different legal wage floors primarily based on the inflation rate accumulated since the last change. Negotiation would only occur in cases of atypically high inflation levels, over 6 percent accumulated over the previous six months (Trejos, 2016). From 1998 to late 2018, this explicit agreement forced the minimum wage to stagnate in real terms, as Figure 1 illustrates.

Figure 1: Minimum Wage Minimorum (CPI-2015 Deflated. January 2000=100)

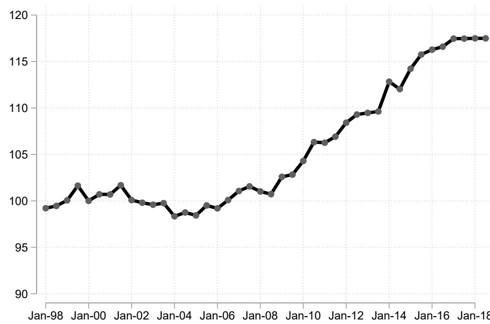
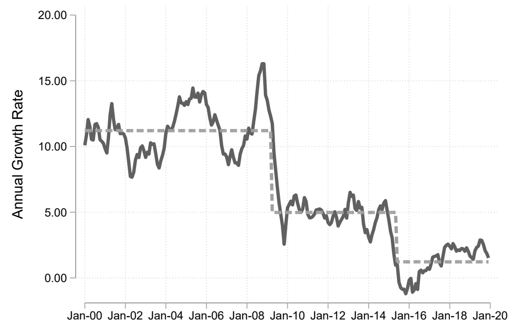


Figure 2: Annual Inflation Rate (CPI-2015)



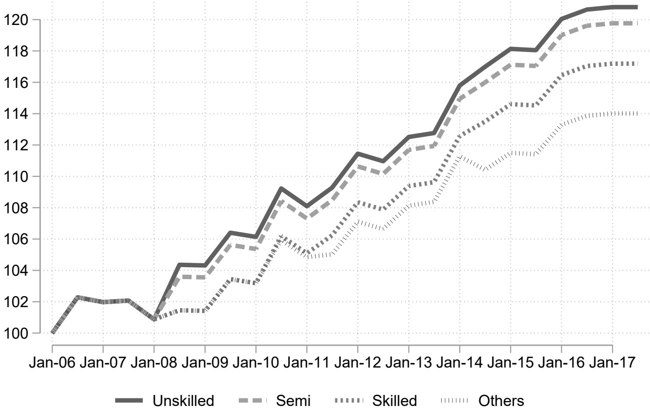
Notes: The Minimum wage minimorum is the lowest level of the multi-tier system, corresponding to low-skilled occupations
Source: Ministry of Labor and Social Security (MTSS) and Central Bank of Costa Rica (BCCR)

Starting 2009, Costa Rica experienced a rapid decline in the inflation rate, a direct result of the adoption of an inflation-targeting regime, and the abrupt decrease in the international price of commodities due to the great recession (See Figure 2). These elements lead to an automatic and significant increase in the minimum wage between 2009 and 2016, as the 1998 agreement opened the room for negotiation only in cases of atypically high inflation rates and given the fact that inflation expectations slowly adjusted to the new inflationary steady state. In late 2011, the NCS and the Central Government agreed upon a new formula that takes into account recent but now expected inflation and GDP per capita during the past five years. Such a transition explains why the minimum wage behavior stabilizes in real terms after 2016. As I discuss in Section 4, I exploit this setting dynamics in the minimum wage to capture how firms adjust their production process to the policy.

The NCS decided to increase the minimum wage of the lower-skilled categories relatively more on three occasions (2008, 2012 and 2014). Hence, by 2017, low-skilled occupations experienced a sharper increase in the legal wage floor (see Figure 3). As it can be read from the NCS minutes that contain the discussion around each minimum wage adjustment decision (MTSS, 2008, 2012, 2014), the resolution of increasing low-skilled legal

wage floors relatively more was mostly because under the new inflation rates, the indexation would lead to a small increase that would break a long period of two-digit growth rates, causing some social and political discontent. In other words, inflationary inertia was the main factor behind the decision-making process and the upward trend observed between 2008 and 2016.

Figure 3: Costa Rica: Minimum Wage by Skill Groups
(CPI-2015 deflated. January 2006=100)

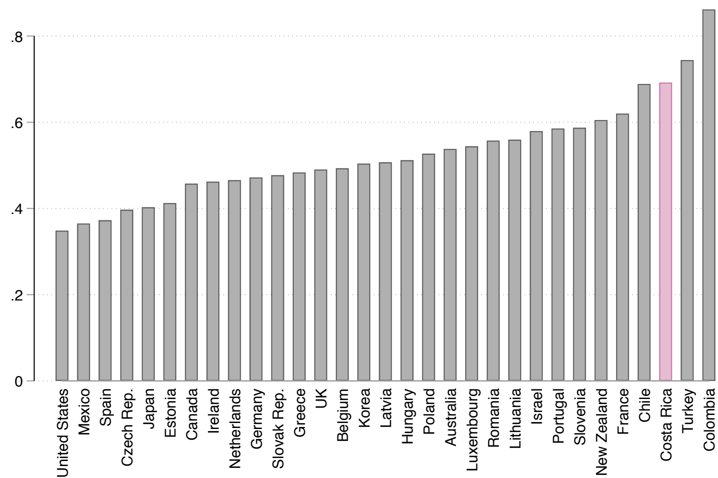


Notes: "Others" include specialized occupations, and university graduates.
Source: Ministry of Labor and Social Security (MTSS)

2.3 Policy Bindingness

One salient feature of Costa Rica's minimum wage policy is that its bite into the wage distribution is deep. Figure 4 offers an international comparison, placing Costa Rica as one of the economies with the highest minimum wage.

Figure 4: Kaitz Index Across OECD countries
(Percentage of median wage. 2015)



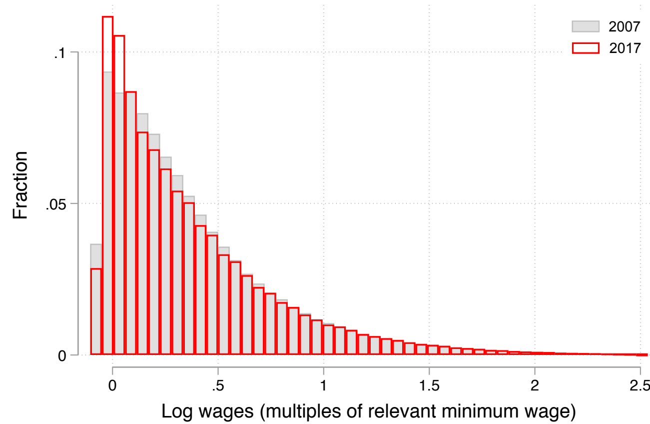
Notes: Minimum relative to median wages of full-time workers
Source: OECD LFS

Similarly, Figure 5 illustrates the aggregate bindingness and the enforcement of the policy by showing a substantial wage compression around the wage floors. Table 2 additionally shows that there is important heterogeneity across occupational and skill groups: Column (1) shows that the Kaitz index –the ratio of the minimum wage to the median wage– of the minimum wage for low-skilled workers with respect the wages of all workers is around 70%[4], above the levels reported by the OECD average (53%), France (62%) and the U.S. (34%) in 2017. Moreover, the minimum wage binds asymmetrically depending on skill groups, with a stronger bite for the lower-skill categories. The strong bite of the minimum wage is key as modest increases over a high base may be sufficient to force firms to modify their behavior. The Kaitz index shows a positive trend in consonance with the nominal and real adjustment of the wage floors that moderates in 2016-2017 as the setting pressure stabilizes back again to show a similar trend before 2007.[5] Therefore, this paper draws on both intertemporal and occupational variation of the minimum wage to infer the policy's economic incidence.

[4]The estimation of the minimum wage bite is roughly the same as the reported by the OECD that incorporates wages of the informal sector, see Figure 4.

[5]Figure B.1 shows the change in the wage distribution between 2008 and 2017 by the main occupational groups. Overall, these graphs show that the observed increase in the legal wage floors asymmetrically compressed the wage distribution across the different groups.

Figure 5: Wage Distribution



Notes: Figure shows the frequency distribution of monthly log earnings in 2008 (last year before the steady increase in the real minimum wage), and in 2017 (when the adjustments stabilized in real terms). Monthly wages are CPI-2015 deflated. Sample selection restricts to full-time workers aged 18-60 employed by the private-sector.

Table 2: Kaitz Index by Minimum Wage Group

	All	Low skilled	Semi Skilled	Skilled	Technical Low-skilled	Specialized	Technical High-skilled	Bachelors University	University Graduate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
2006	0.71	0.82	0.79	0.71	0.57	0.60	0.63	0.60	0.46
2007	0.71	0.81	0.77	0.71	0.58	0.60	0.64	0.58	0.45
2008	0.71	0.81	0.76	0.77	0.64	0.71	0.66	0.64	0.52
2009	0.73	0.82	0.78	0.79	0.62	0.70	0.68	0.64	0.51
2010	0.73	0.82	0.77	0.77	0.61	0.69	0.67	0.62	0.50
2011	0.73	0.82	0.77	0.76	0.59	0.67	0.67	0.59	0.48
2012	0.72	0.82	0.77	0.75	0.58	0.66	0.67	0.57	0.46
2013	0.72	0.82	0.77	0.74	0.59	0.67	0.67	0.57	0.45
2014	0.73	0.82	0.78	0.74	0.60	0.67	0.68	0.56	0.45
2015	0.72	0.82	0.77	0.74	0.61	0.67	0.68	0.55	0.45
2016	0.72	0.82	0.76	0.73	0.60	0.66	0.64	0.53	0.44
2017	0.70	0.80	0.75	0.72	0.59	0.64	0.64	0.52	0.43

Notes: The Kaitz Index is defined as the ratio of minimum wage to median wage. Column (1) shows the Kaitz Index for all workers with respect to the lowest minimum wage for international comparison.
Source: Ministry of Labor and Social Security (MTSS) and CR-LEED

The share of workers directly exposed to the policy is also significantly higher than the reported in related studies for other economies, particularly for the U.S. (e.g., Flinn (2011)). Nonetheless, this share remains relatively constant over time, which is expected given the frequency and structure of the minimum wage adjustments.

Table 3: Share of Workers by Minimum Wage Group

	Low Skilled (1)	Semi Skilled (2)	Skilled (3)	Technical Low-Skilled (4)	Specialized (5)	Technical High-Skilled (6)	Bachelors University (7)	University Graduate (8)
2006	16.42	8.52	8.10	3.70	3.61	3.71	3.01	2.35
2007	16.26	7.88	8.03	3.81	3.10	3.71	2.65	2.13
2008	14.65	7.59	10.92	8.20	5.44	2.60	3.66	2.23
2009	16.71	8.09	11.30	7.61	5.70	4.18	4.56	2.80
2010	16.27	8.17	10.72	5.95	5.20	3.42	4.55	2.23
2011	16.21	7.83	9.90	4.67	4.41	3.27	3.48	2.73
2012	15.52	7.68	8.84	3.96	3.72	3.09	3.27	2.36
2013	16.04	7.56	9.45	4.28	4.22	3.58	2.84	2.44
2014	16.25	8.25	9.82	4.06	4.08	4.77	3.95	2.82
2015	16.72	8.28	9.71	5.10	4.35	4.29	3.11	2.54
2016	15.98	8.07	8.75	4.96	3.68	3.24	2.41	2.41
2017	15.09	8.34	8.97	4.77	3.85	3.20	2.70	2.17

Notes: Table shows the number of workers earning around 5% or above the minimum wage as percentage of total workers in the corresponding skill group.
Source: Ministry of Labor and Social Security (MTSS) and CR-LEED

3 Data and Descriptive Statistics

For this paper, I combine different administrative datasets that collectively comprise the universe of workers and firms in Costa Rica's formal sector. The first source of information is a monthly linked employer-employee data (CR-LEED) that I construct using raw firm-level records reported to the Costa Rican Social Security Fund and secured by the Central Bank of Costa Rica (BCCR). This data source provides me the worker-level detail to construct the minimum wage exposure measures. The information matches workers and employers from 2006 to 2017 and identifies each person and each firm with a legal identifier that facilitates the merging with other administrative sources. By nature, these reports exclude firms not contributing to social security or providing tax declarations[6]. For each worker, I observe sociodemographics such as age, nationality, sex, and residence. The data includes relevant characteristics of the job match such as monthly labor earnings, full-time status, sick-leave status. Jobs are likewise organized into occupations according to the tasks and duties that are undertaken in the job, consistent with the International Standard Classification of Occupations (ISCO) at a 4-digit level. I

[6] This represents part of the informal sector. Rates of informality in Costa Rica are around 25% for individuals aged 15-64, which are lower than the Latin American average but higher than the OECD average (OECD, 2017). See Appendix 5.5 for a more in-depth discussion on Costa Rica's informal sector.

map the worker with the relevant minimum wage using these occupational codes, correspondence tables provided by the Ministry of Labor and Social Security (MTSS), and employer guidelines provided by the Social Security Administration Fund (CCSS). Employers do not report worked hours, which is a significant but usual limitation found in most employer-employee datasets. To overcome this limitation, I track the employer-employee relationship each month to flag atypical monthly wages, as in Sorkin (2018); Crane et al. (2019); Song et al. (2019); Lachowska et al. (2020) and literature within. These observations could be due to partial months due to labor transitions or sick leaves, for example. I avoid using these observations when aggregating the information into quarter and yearly levels. Refer to Appendix A for more detail on the sources and the data construction.

The second source comes from the universe of corporate tax returns reported by firms from 2005 to 2018 (REVEC). These reports consist of annual balance sheets and income statements. The Central Bank of Costa Rica (BCCR) collects the information and incorporates information from customs (exports and imports) and conducts an extensive revision to detect anomalies and correct misreports. Since both workers and firms are identified using the same legal identifiers, it is straightforward to combine both data sources.[7] The outcome is a clean and comprehensive picture of the labor market at an annual level, representing a significant advantage to overcome common and significant shortcomings found in prior work. For instance, the data's administrative and fiscal nature allows tracking with high precision firm entry and exit. Furthermore, I can observe each firm's labor and wage bill composition in great detail to compute accurate and granular measures of exposure to the minimum wage. Lack of worker-level detail has forced prior work to use average wages to estimate minimum wage exposure (Mayneris et al. (2018); Chen (2019); Hau et al. (2020)), introducing additional biases into the estimation.

For the remaining of the analysis, I restrict the sample, as discussed before, to full-time workers aged 18 to 60 employed by a private-sector firm. Hence, I exclude self-employed individuals, households, non-profit firms, and state-owned enterprises, representing around 30% of total firm-year observations in the dataset. Also, I drop firms consistenlty reporting fewer than 2012 US$2,000, and less than four workers, employer-employee matches with a duration less than two quarters. Even though this introduces a size threshold, such cutoff is not as high as other papers need to impose, a desirable circumstance since small firms are usually more exposed to the minimum wage. A high

[7]Some firms employ workers using a different ID than the one used in the corporate tax forms. The Central Bank of Costa Rica corrects these issues by identifying corporate and firm groups. I also perform a comprehensive check to identify large employers with multiple IDs. Appendix A discusses the data construction strategy and provides more explanation.

threshold could also obscure the identification and timing of firm entry and exit. Other details are explained in Appendix A.

3.1 Descriptive Statistics

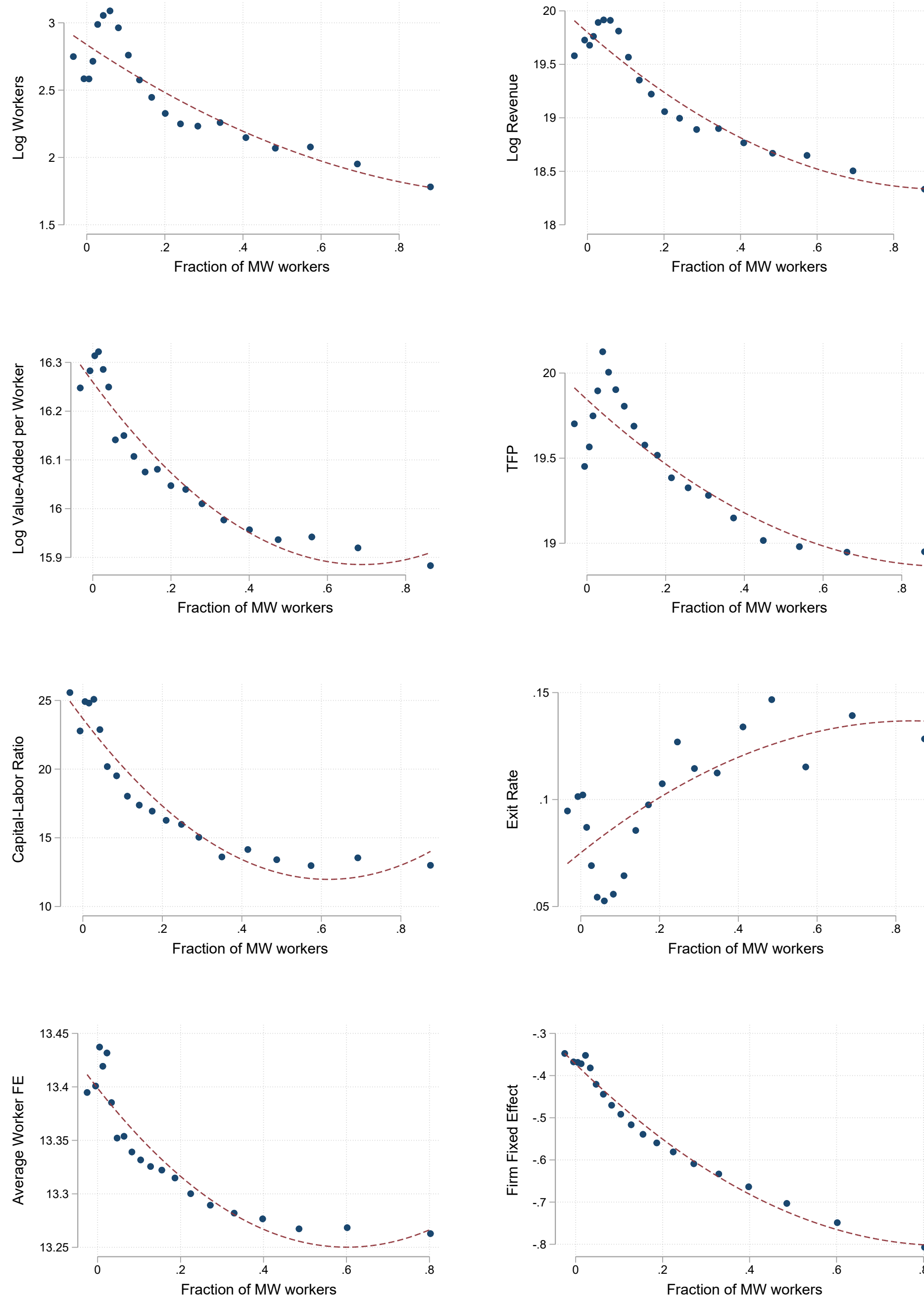
Table 4 summarizes the primary descriptive statistics for the firms in the sample in 2007, and the panel of Figures 6 display binned scatterplots illustrating the non-parametric relationship between key firm characteristics and exposure to the policy. Firms with higher exposure levels have smaller (both in total employment and total revenues), lower productivity, and more labor-intensive. Additionally, firms with high levels of exposure are also lower-paying units. Their employer-specific pay premium and their average wage are negatively associated with the degree of minimum wage exposure. These results suggest to include these characteristics as covariates in the regression analysis.

Table 4: Summary Statistics by Exposure Intensity. 2007

	All	Fraction of Minimum Wage Workers			
		0-25	25-50	50-75	75-100
Wage Bill	16.5	17.1	16.3	16.0	15.6
Average Wage	14.0	14.2	13.9	13.8	13.5
Revenue	18.7	19.1	18.5	18.3	18.0
Workers	41.1	64.7	21.3	16.4	11.4
Labor Share	16.6	17.9	16.4	15.9	13.7
Export Share	2.9	3.9	2.5	1.8	1.1
Capital-Labor Ratio	7.4	8.4	7.2	6.7	5.0
Exit Rate	10.9	8.9	10.2	11.0	16.9
Firms	18,646	9,835	3,452	2,287	3,072
(Fraction of total)	100	52.7	18.5	12.3	16.5

Notes: Export and labor share as proportion of revenues, profitability defined as profits per revenue. Export share include firms with zero exports. Capital-Labor ratio (fixed assets divided by number of workers) in millions of 2012 CRC.
Source: CR-LEED

Figure 6: Firm Characteristics and Minimum Wage Exposure



Notes: Figures show the binned scatterplot relating the firm-level fraction of workers exposed to the the minimum wage and firm outcomes, with the red line representing the best quadratic fit. Regressions include 2-digit industry and year fixed effects. Nominal variables deflated using 2012 GDP deflator. Total factor productivity index (TFP) estimated using a control function approach a la Ackerberg et al. (2015). Capital-Labor Ratio in millions of 2012 CRC. Worker and firm fixed-effects estimated using a time-varying AKM model

As discussed in Section 2, there is significant heterogeneity in the bite of the minimum wage across occupations. As shown in Tables 1 and 2, the Kaitz index and the proportion

of workers earning the legal wage floor is higher in lower-skilled occupations. Moreover, the ratio of the minimum wage and the median wage depicts a positive trend during the period of study that moderates in 2016-2017, consistent with the nominal and real adjustments conducted since 2008.

4 Empirical Strategy

This section describes the empirical strategy followed by the empirical results. I start by discussing the exposure measure and and how I deal with the endogeneity endogeneity issues using an IV approach. Then, I explain the regression framework proposed to capture the policy's effect on firms, starting with the firm-level analysis and concluding with the firm-entry analysis.

4.1 Minimum Wage Exposure

The key to identify effects of minimum wages on firms-level outcomes is to define a firm-specific minimum wage exposure measure. Costa Rica's minimum wage setting implies that firms are differentially exposed to the common minimum wage adjustments based on their occupational composition. As shown before, the minimum wages corresponding to low-skilled occupations experienced a more substantial increase, and the "bite" (ratio of minimum wage and median wage) varies across skill groups. Consequently, minimum wage exposure varies by labor intensity as well as the occupational structure of the firm. This particular structure and the richness of the data represent an intriguing venue to estimate the minimum wage incidence. This feature of the Costa Rican labor market provides firm-level variation to identify the effects of minimum wage increases.

I define minimum wage exposure as the percentage increase in firm j's wage bill required to bring all of its current employees up to the new minimum wage[8]:

$$Exposure_{j,t} = \frac{\sum_{i,o} \max\left(w_{o,t}^{min} - w_{i,j,o,t-1}, 0\right)}{\sum_{i,o} w_{i,j,o,t-1}}$$

This variable can also be interpreted as a firm-level compliance cost or a firm-specific minimum wage increase. It measures the distance between each worker's wage and the next year's minimum wage level.[9] By definition, this exposure measure requires com-

[8]Both wages and minimum wages are deflated using the CPI

[9]Between 2006 and 2015, minimum wages were adjusted in January and June of each year. I use the January level for constructing the exposure measure.

plete worker-level detail for an accurate estimation.[10] The granular detail in the Costa Rican data represents a pivotal advantage to overcome these limitations, as I can construct accurate exposure measures for each firm in the labor market, regardless of its size or industry. If $Exposure_{j,t}$ increases by one percentage point, then the minimum wage policy is forcing the firm to increase its wage bill by one percent. Draca et al. (2011) also used a similar metric to measure minimum wage exposure, calling it the wage gap.

$Exposure_{jt}$ is measured based on the labor composition the period before the minimum wage change. In other words, it measures the firm-level increase in the wage bill induced by the minimum wage if the employer does not change its employment structure. Using current minimum wage changes and individual wages could be misleading as it would capture adjustments that the firm already implemented to comply with the policy. However, $Exposure_{jt}$ is still potentially endogenous, as it could be correlated to unobservables affecting firm outcomes. For example, an unobserved productivity shock can lead to changes in the employment composition and levels, simultaneously affecting minimum wage exposure and changes in outcome variables. Additionally, exposure could be correlated to unobservables that simultaneously put the firm closer to the minimum wage and the exit margin. To address this issue, define $z_{j,o,t}$ as the occupational share: the number of workers employed in occupation o relative to the total employment within the firm. Then, the exposure measure can be decomposed as the weighted average of exposure in each occupation category:

$$Exposure_{j,t} = \sum_{o} z_{j,o,t} Exposure_{j,o,t}$$

This structure precisely emphasizes that firms are going to be differentially exposed to the common minimum wage adjustments based on their occupational composition. Hence, I consider $Exposure^{IV}_{j,t}$, an instrument for $Exposure_{j,t}$, defined as follows:

$$Exposure^{IV}_{j,t} = \sum_{o} z_{j,o,2007} mw_{o,t+1}$$

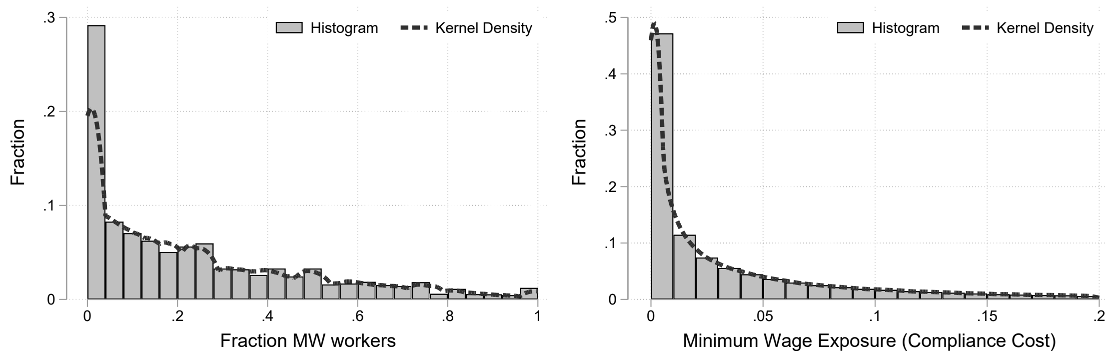
Where $mw_{o,t+1}$ is the percent change in the real minimum wage for occupation o relative to 2007 levels and $z_{j,o,2007}$ is the respective occupational share in firm j, estimated in 2007. By fixing the occupational shares to the 2007 levels, I analyze if firms with a particular occupational composition experience differential changes in outcomes following

[10] The existing literature has proven that such data requirement is difficult to meet, as there are not many information sources with such detail. Most of prior work measures of treatment intensity based on firm average wages, due to lack of worker-level data. As explain by Draca et al. (2011); Mayneris et al. (2018), any continuous measure of treatment intensity based on firm average wage is potentially noisy, especially when defining groups based on treatment.

the minimum wage increases. The $Exposure^{IV}_{j,t}$ variable can be interpreted as a firm-level minimum wage increase, using the initial occupational shares as weights. The instrument is, by nature, a shift-share instrument and, as shown by Goldsmith-Pinkham et al. (2020), the empirical strategy is numerically equivalent to a generalized method of moments (GMM) estimator with the occupation shares as instruments and a weight matrix composed by the occupation-specific minimum wage increases.

Figure 7 summarizes the distribution of minimum wage exposure across firms in 2007. Consistent with the nature of the policy, there is a considerable concentration of firms with zero exposure. However, there is substantial variation in the degree of exposure among the rest of the firms. Besides, Table 5 confirms Costa Rica's setting extends to a large proportion of the labor market segment. Low binding minimum wage policies are characterized by an unpromising variation of minimum wage exposure, forcing researchers to restrict the analysis on specific sectors and demographics. Moreover, such a lack of variation has been a point of debate. Part of the literature argues that a low binding minimum wage policy is insufficient to detect the policy's true impact on firms (e.g. Sorkin (2015); Meer and West (2016); Neumark (2019); Clemens and Wither (2019)).

Figure 7: Histogram of Minimum Wage Exposure Measures (2007)



Notes: Figures show the histrogram of the firm-year estimated exposure to the minimum wage. Figure on the left shows the fraction of minimum wage workers employed by each firm. Figure on the right displays the wage gap (benchmark minimum wage exposure measure).
Source: CR-LEED

Table 5: Minimum Wage Exposure by Industry, 2006-2007

Industry (2-digit ISIC Rev. 4)	Mean	Median
Agriculture, fishing and mines	0.25	0.19
Manufacturing	0.22	0.15
—Food products	*0.21*	*0.14*
—Wearing apparel	*0.30*	*0.27*
—Wood and of products of wood and cork	*0.31*	*0.30*
—Rubber and plastics products	*0.15*	*0.06*
—Computer, electronic and optical products	*0.12*	*0.07*
—Manufacture of machinery and equipment	*0.19*	*0.11*
Electricity , gas and water	0.17	0.07
Construction	0.20	0.14
Wholesale and retail trade	0.17	0.11
Accommodation and food service activities	0.20	0.14
Transportation and storage	0.19	0.11
Information and communication	0.15	0.08
Financial and insurance activities, real estate	0.12	0.04
Professional, scientific and technical activities	0.18	0.13
—Management consultancy activities	*0.11*	*0.03*
—Advertising and market research	*0.18*	*0.13*
—Security and investigation activities	*0.21*	*0.16*
Education	0.24	0.18
Human health and social work activities	0.22	0.18
Arts, entertainment and recreation	0.18	0.11
Other service activities	0.21	0.17

Notes: Table shows the fraction of minimum wage workers by industry in 2006-2007 (average).

Regarding the heterogeneity of exposure across occupations, Table 6 decomposes the average minimum wage exposure across skill groups and occupational groups. The lion share of exposure comes from low-skilled (50.9%) and medium-skilled occupations (38.9%). Only a 10.2% of policy exposure comes from high-skilled occupations. Similarly, firms are predominantly exposed to the policy through occupations intensive in routinary tasks and non-routinary manual tasks.[11] This pattern emphasizes that minimum wage workers are employed in occupations with lower educational levels and more susceptible to automatization.

[11] Following **??**, I measure the task intensity across occupations. Then I define five task groups: non-routine analytic, non-routine interactive, routine cognitive, routine manual, and non-routine manual tasks

Table 6: Minimum Wage Exposure By Occupation Groups, 2007

Wage Gap	6.2
Fraction MW Workers	15.9
Wage Gap Decomposition (% of total)	
By Skill Level	
High-Skilled	10.2
Medium-Skilled	38.9
Low-Skilled	50.9
By Task	
Non-Routine Analytic	4.9
Non-Routine Interactive	7.1
Routine Cognitive	30.6
Routine Manual	10.1
Non-Routine Manual	47.3

Notes: Table shows the decomposition of firm-level exposure to the minimum wage (cost of compliance) across different occupation groups.

4.1.1 Identification Assumptions

In this case, the implied IV strategy is that the initial occupation shares measure the differential exposure to the minimum wage increases. As I show in the next subsections, I focus on differential *changes* in the outcome variables (e.g., log cumulative *changes* in employment). The occupational shares could be correlated with outcome levels without representing an identification threat. The central identification assumption states that the initial shares are exogenous to the error term conditional on observables. In other words, there is an issue if the initial occupation composition predicts *changes* in outcomes through channels other than minimum wage exposure.

First, fixing the occupational composition to 2007 levels seeks to support the identification assumptions. As described in Section 2, such a year concludes almost a decade in which all minimum wages were stable in both real and relative terms (See Figure 1 and 3). Minimum wage adjustments were explicitly made to compensate for past inflation, so the minimum wage variation before 2008 was confounded with the wage adjustments employers make to compensate workers for inflation. Hence, before 2008, differential exposure to the minimum wage should not have driven differential changes in the studied outcomes if the identification assumption holds.

Still, the identification assumption previously stated is not directly testable. I discuss its plausibility based on the recommended strategy by Goldsmith-Pinkham et al. (2020).

First, I explore how much the 2007 occupational shares are correlated with other potential confounders, also measured in 2007. For such purposes, I focus on five main occupation groups: low skilled, semi-skilled, skilled, specialized, and college graduate.[12] I estimate the corresponding occupational share for each group, and I compute the correlation between the occupational shares and key firm characteristics: labor share, capital share, export share, import share, and profitability. This set of variables cover the relative importance of labor and capital, firm size, and international trade exposure, as well as how close the firm is to the margin of exit. The idea is to explore if the instruments (occupational shares) are correlated with initial firm characteristics that could lead to confounding channels other than the minimum wage. For example, firms with high low-skilled occupational shares could also operate closer to the exit margin, so these firms may be prone to reductions in their employment levels. Similarly, firms with high skilled occupations could be significantly exposed to international trade, so productivity improvements could be linked to this channel. Reassuringly, Table 7 shows no apparent systematic pattern of correlation.

Table 7: Correlation between occupational shares and firm characteristics in 2007

	Low Skilled	Semi-Skilled	Skilled	Specialized	College Graduate	Aggregate Instrument
Labor Share	-0.405	-0.070	-0.188	0.104	0.146	-0.040
	(0.316)	(0.091)	(0.153)	(0.080)	(0.160)	(0.025)
Capital Share	-0.002	-0.004	-0.004	-0.000	0.004	-0.001
	(0.006)	(0.006)	(0.003)	(0.001)	(0.004)	(0.001)
Export Share	-0.209	-1.980	0.080	0.532	0.179	-0.177
	(0.633)	(1.511)	(0.388)	(0.589)	(0.402)	(0.125)
Import Share	0.109	-1.620	0.070	0.166	0.369	0.015
	(0.092)	(1.047)	(0.046)	(0.429)	(0.417)	(0.092)
Profitability	0.006	-0.010	-0.006	-0.002	0.013	-0.000
	(0.037)	(0.022)	(0.017)	(0.004)	(0.013)	(0.001)
Obs.	13,586	13,586	13,586	13,586	13,586	13,586
R^2	0.366	0.316	0.202	0.309	0.200	0.311

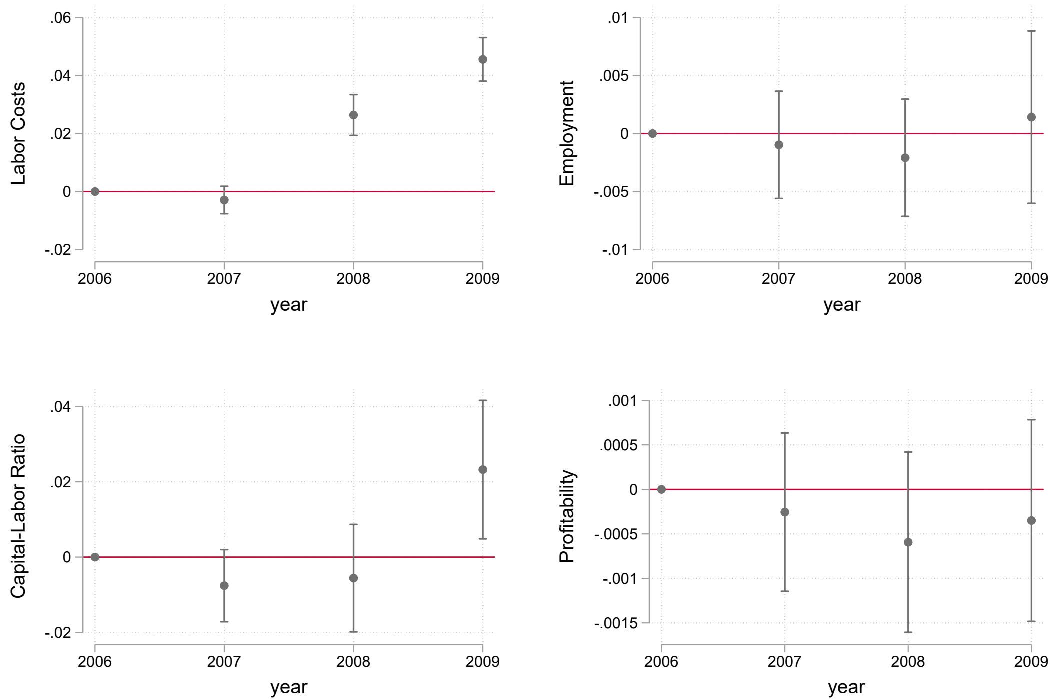
Notes: Table shows the result of a regression of the occupational share on firm characteristics, both estimated in 2007. The final column corresponds to the aggregate instrument, i.e., the interaction of all occupational shares with the respective minimum wage increase. Standard errors in parenthesis. For legibility, coefficients and standard errors are scaled by 10,000,000. * $p<0.05$

Second, I explore for parallel pre-trends. As mentioned previously, the idea is to ex-

[12] Goldsmith-Pinkham et al. (2020) suggest estimating Rotemberg weights to identify the most representative shares driving the identification power. Instead, I consider the main occupational groups, although it should lead to similar conclusions. Since I am constructing firm-level instruments, computing Rotemberg weights become computationally intensive.

plore if firms showed a different behavior depending on minimum wage exposure before 2008. Unfortunately, there is no available information before 2006 to extend the analysis beyond this point, but the available information discards the presence of pre-trends. Figure 8 displays the results of a set of regression of the log changes in firm outcomes (relative to 2007) on the minimum wage exposure instrument in 2007, i.e., the inner product of the occupational shares and the occupation-specific minimum wage increases, both in 2007. The plots indicate that before 2007, and in some cases 2008, there is no significant difference in the evolution of the firm characteristics between exposed and non-exposed firms.

Figure 8: Pre-Trends on Selected Firm Outcomes



Notes: Figures report results of regressing the log outcome changes relative to 2006 on the minimum wage exposure instrument in 2007, alongside 95% confidence intervals estimated using robust standard errors.

Finally, results suggest a strong first-stage and no evidence of misspecification. The F-statistics are sufficiently large to support the relevance assumptions behind the strategy and the overidentification tests fail to reject the null of misspecification (See Table 9). I will discuss these statistics in more detail in Section 5.

4.2 Regression Framework

The main goal of the paper is to estimate if differential exposure to the minimum wage leads to differential changes in relevant firm outcomes. To account for dynamics in the response, I estimate a sequence of regressions based on the local projection framework proposed by Jordà (2005). For firm j at year t and horizon $h = 1, ..., 5$, I consider the following specification[13]:

$$\Delta_h \ln Y_{j,t+h} = \alpha_h + \beta^h Exposure_{j,t} + \sum_{i=0}^{h-1} b_i Exposure_{j,t+1+i} + \gamma_h X_j + \nu_{s,t+h} + u_{j,t+h} \quad (1)$$

With $Y_{j,t}$ denoting firm's j outcome (e.g., employment, revenue, productivity, firm exit), $\Delta_h \ln Y_{j,t+h} = \ln Y_{j,t+h} - \ln Y_{j,t-1}$ the cumulative difference at horizon h.[14] $\nu_{s,t+h}$ denotes a set of industry (2-digit)-year controls and X_j a battery of firm-level characteristics in 2006-2007.[15] As discussed above, one p.p. increase in $Exposure_{j,t}$ means that the minimum wage policy is pushing firms to increase their wage bills by one percent to comply with the new requirements.

In case of a single and permanent minimum wage increase, a local projection of $\Delta_h \ln Y_{j,t+h}$ on $Exposure_{j,t}$ would be enough to capture short and longer-term responses to a single period minimum wage change at t. However, minimum wages also vary between $t+1$ and $t+h$ following the initial change captured in $Exposure_{j,t}$. Therefore, the h-period cumulative change in outcome Y combines the impact of the initial and subsequent minimum wage changes. To account for this staggered nature, equation (1) controls for those minimum wage changes between $t+1$ and $t+h$ through the $\sum_{i=0}^{h-1} b_i Exposure_{j,t+1+i}$ term. Hence, β^h would be the coefficient of interest: the firm-level response to a minimum wage change in t at different year horizons, controlling for subsequent minimum wage changes.

As mentioned previously, one issue is that $Exposure_{j,t}$ is likely to be endogenous. Then, for each relevant year horizon h, I instrument the exposure term using the instrument discussed previously, $Exposure^{IV}_{j,t+h} = \sum_o z_{j,o,2007} mw_{o,t+h}$.

To have a more comparable and intuitive estimate, I translate the impulse responses

[13] For $h = 0$, consider $\Delta_0 \ln Y_{j,t} = \alpha_0 + \beta_0 Exposure_{j,t} + \gamma_0 X_j + \nu_{s,t} + u_{j,t}$

[14] For firm exit, define $\Delta_h Exit_{j,t+h} = Exit_{j,t+h} - Exit_{j,t-1}$, with $Exit_{j,t}$ an indicator taking the value of one if the firm exits after $t+1$, 0 otherwise.

[15] I measure and fix these characteristics in the 2006-2007 as these two years represent the ending of a long period of real minimum wage stability, as previously discussed. Variables include export share, import share, profitability, labor share, capital share, average industry-level exposure. These covariates control for the relative importance of capital and labor within the firm, international trade exposure, firm size, and how close the firm is to the exit margin. I additionally include the square of these variables, and the average industry-level exposure in 2006-2007

to minimum wage elasticities ε^{y}_{t+h}, defined as the percent change in the outcome variable y due to a one percent increase in the labor costs *induced* by the minimum wage:

$$\varepsilon^{y}_{t+h} = \frac{\Delta_h \ln Y_{j,t+h}}{\Delta_h \ln W_{j,t+h}} = \frac{\beta_{y,t+h}}{\beta_{\text{Wage Bill},t+h}}$$

Capturing long-term responses to minimum wage increases is particularly challenging. As argued by Sorkin (2015), in lack of indexation and if adjustments are phased over several years, nominal minimum wage increases are temporary and even not binding. Inflation and real wages in the relevant labor market erode the initial pressure from the policy rapidly. Costa Rica's setting is pivotal for exploring longer-term responses, as the strong indexation leads to more permanent minimum wage increases.

To capture the minimum wage incidency on firm entry, I aggregate the data to 4, 5 and 6 digit industry levels and, similar to the incumbent analysis, I estimate the following sequence of local projections:

$$\Delta_h \log(Entry_{I,t+h}) = \alpha_h + \beta_h Exposure_{I,t-1} + \sum_{i=0}^{h-1} b_i Exposure_{I,t+i} + \gamma_h X_I + \nu_{s,t+h} + u_{I,t+h} \tag{2}$$

Both, the industry-level exposure measures and the corresponding instrument are constructed similar to the procedure adopted at the firm-level.[16] Specifically, $Exposure_{I,t+h}$ is instrumented using $Exposure^{IV}_{I,t} = \sum_o z_{I,o,2007} mw_{o,t+1}$, with $z_{I,o,2007}$ industry-level occupational shares. I measure firm entry in two main ways. The first one is the startup or entry rate: the fraction of new firms[17] (age 0 firms) relative to the total number of private sector firms in the industry I at t. The second one, the startup employment share, is defined as the employment at new firms relative to the total private employment in the industry I at t. The administrative and fiscal nature of the data employed in this paper is crucial for this entry analysis. The frequency and coverage of the information facilitate the identification of the entry and the corresponding timing, without being susceptible to attrition biases related to survey or rotating panel data. X_I controls for heterogeneity in the 2006-2007 period by including industry-level characteristics (export and import share, labor share, capital share, profitability, employment level), I include 2-digit industry and

[16]The procedure to construct the exposure measure and its instrument follows the same strategy but I consider an *industry* as the unit of analysis instead of a *firm*.

[17]I use the employer-employee dataset (CR-LEED) and the firm-level information (REVEC) to precisely identify the entry, exit of firms, and the respective timing. The administrative nature of the information is a crucial advantage to truly capture firm entry and exit, as other papers rely on surveys that naturally introduce additional noise. More details in Section 3 and Appendix A.

year dummies and I use robust standard errors.

5 Estimation Results

Table 8 reports the dynamic responses following equation (1) and Table 9 the respective elasticities, i.e., the percent change in the outcome variable due to a one percent increase in the labor costs induced by the minimum wages.[18] Table 8 also reports the first-stage F-statistics and the overidentification tests. The F-statistics greatly exceeds different critical values (e.g., Stock-Yogo weak ID test critical values), confirming a robust first-stage. Furthermore, for all horizons the overidentification tests do not reject the null hypothesis of no misspecification. More precisely, the null establishes that the instruments are valid, i.e., uncorrelated with the error term, and that the excluded instruments are correctly excluded from the estimated equation.

[18] Dube (2019a) explains that this elasticity has been extensively used, mostly to report disemployment effects, because it accounts for the minimum wage's bindingness. Moreover, these elasticities facilitate the comparison across studies.

Table 8: Firm Outcome Responses to Minimum Wage Exposure

	Horizon (Year)					
	0	1	2	3	4	5
Wage Bill	0.135*	0.358*	0.577*	0.783*	0.944*	0.998*
	(0.012)	(0.021)	(0.026)	(0.031)	(0.036)	(0.040)
Labor Share	0.092*	0.211*	0.305*	0.417*	0.450*	0.439*
	(0.017)	(0.026)	(0.031)	(0.036)	(0.040)	(0.043)
Employment	-0.012	-0.041*	-0.059*	-0.086*	-0.119*	-0.125*
	(0.013)	(0.020)	(0.023)	(0.026)	(0.030)	(0.035)
Capital	-0.018	0.106*	0.225*	0.340*	0.408*	0.418*
	(0.024)	(0.038)	(0.050)	(0.059)	(0.069)	(0.079)
Capital-Labor Ratio	0.034	0.130*	0.257*	0.369*	0.437*	0.519*
	(0.021)	(0.038)	(0.052)	(0.061)	(0.068)	(0.079)
Profitability	-0.013*	-0.035*	-0.050*	-0.058*	-0.071*	-0.087*
	(0.005)	(0.008)	(0.010)	(0.012)	(0.014)	(0.016)
Revenues	0.030*	0.100*	0.196*	0.273*	0.349*	0.377*
	(0.012)	(0.020)	(0.026)	(0.031)	(0.035)	(0.038)
Value-Added per Worker	-0.001	0.016	0.063*	0.084*	0.113*	0.138*
	(0.021)	(0.025)	(0.029)	(0.033)	(0.037)	(0.039)
Exit Probability	0.115*	0.115*	0.093*	0.081*	0.081*	0.064*
	(0.009)	(0.011)	(0.012)	(0.012)	(0.013)	(0.013)
Observations	142,360	120,310	101,791	85,657	71,258	57,805
F-Statistic	4,815.2	3,318.4	383.2	288.9	205.2	145.7
Overidentification Test	[0.219]	[0.127]	[0.128]	[0.505]	[0.942]	[0.571]

Notes: Table shows the log changes in the outcome variable to a one percent point increase the compliance cost to the minimum wage, following equation (1). Robust standard errors in parenthesis. Overidentification test reports the p-value (in brackets) for the null hypothesis that the instruments are valid (no misspecification). * $p<0.05$

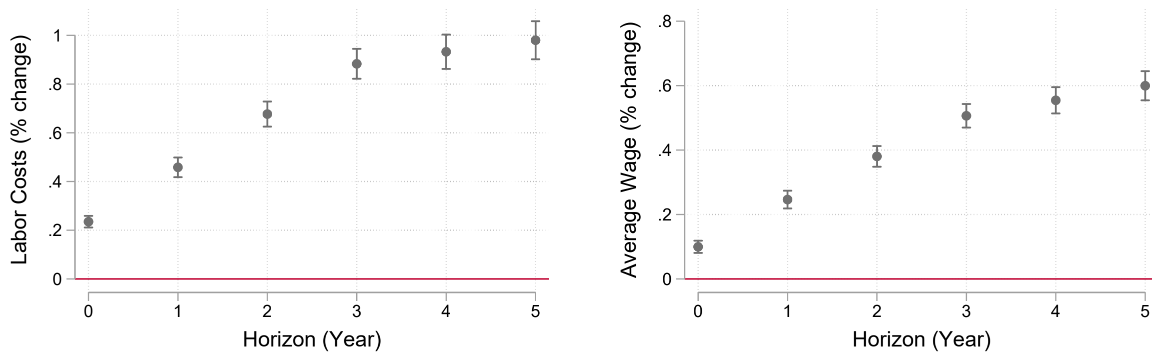
Table 9: Firm Outcome Elasticities to Minimum Wage Exposure

	Horizon (Year)					
	0	1	2	3	4	5
Labor Share	0.683*	0.584*	0.523*	0.523*	0.477*	0.442*
	(0.069)	(0.064)	(0.050)	(0.043)	(0.039)	(0.040)
Employment	-0.050	-0.117*	-0.107*	-0.12*	-0.137*	-0.147*
	(0.060)	(0.056)	(0.044)	(0.036)	(0.034)	(0.038)
Capital	-0.062	0.296*	0.393*	0.437*	0.438*	0.43*
	(0.131)	(0.109)	(0.093)	(0.080)	(0.075)	(0.082)
Capital-Labor Ratio	0.261	0.365*	0.445*	0.469*	0.463*	0.517*
	(0.157)	(0.106)	(0.092)	(0.077)	(0.072)	(0.079)
Profitability	-0.097*	-0.099*	-0.089*	-0.078*	-0.075*	-0.085*
	(0.029)	(0.021)	(0.017)	(0.016)	(0.014)	(0.015)
Revenues	0.223*	0.281*	0.343*	0.354*	0.372*	0.371*
	(0.065)	(0.050)	(0.040)	(0.036)	(0.032)	(0.035)
Value-Added per Worker	-0.006	0.047	0.116*	0.119*	0.127*	0.155*
	(0.089)	(0.069)	(0.052)	(0.044)	(0.040)	(0.042)
Observations	142,360	120,310	101,791	85,657	71,258	57,805

Notes: Table shows the percent change in the outcome variable due to a one percent increase in the labor costs induced by the minimum wage. Bootstrapped standard errors in parenthesis, computed after 1,000 iterations. * $p<0.05$

Figure 9 reports the labor costs (total wage bill) and average wage responses to one percentage point increase in minimum wage exposure. One percentage point increase in minimum wage exposure means that the firm has to increase its total wage bill by one percent to comply with the new minimum wage levels. Overall, the results validate that higher minimum wages persistently raised labor costs for firms.

Figure 9: Minimum Wages, Labor Costs and Average Wages



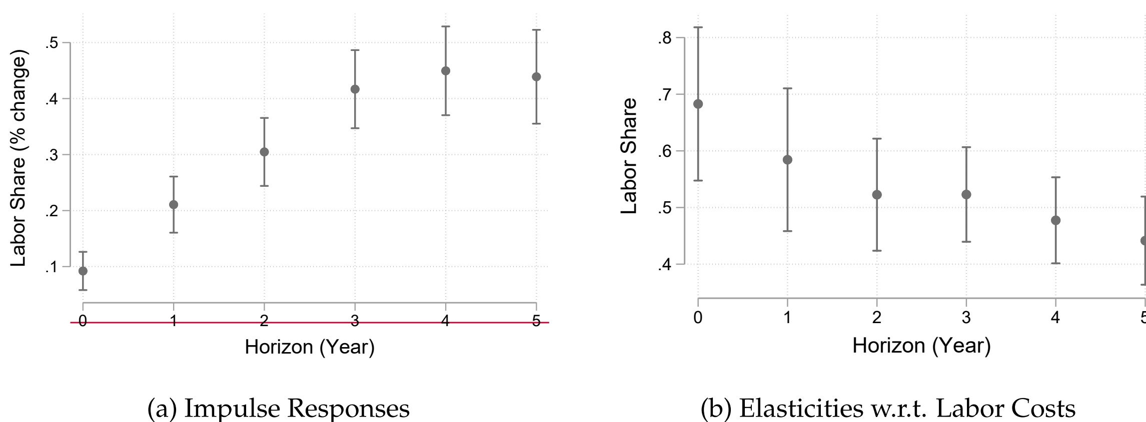
(a) Impulse Responses

Notes: Figures show the response to a one percentage point in firm-level minimum wage exposure, calculated using equation (1), including 95 percent confidence intervals estimated using robust standard errors.

5.1 Minimum Wages and Firm-Level Labor Shares

Raising minimum wages induce firms to increase their labor shares. As shown in Figure 10, the associated elasticity peaks in the first years (0.67) and declines in magnitude to a value of 0.45 five years after the initial minimum wage change. Put differently, a one percent increase in the labor costs induced by the minimum wage increases firm-level labor shares by 0.45-0.67 percent.

Figure 10: Minimum Wages and Labor Shares



(a) Impulse Responses

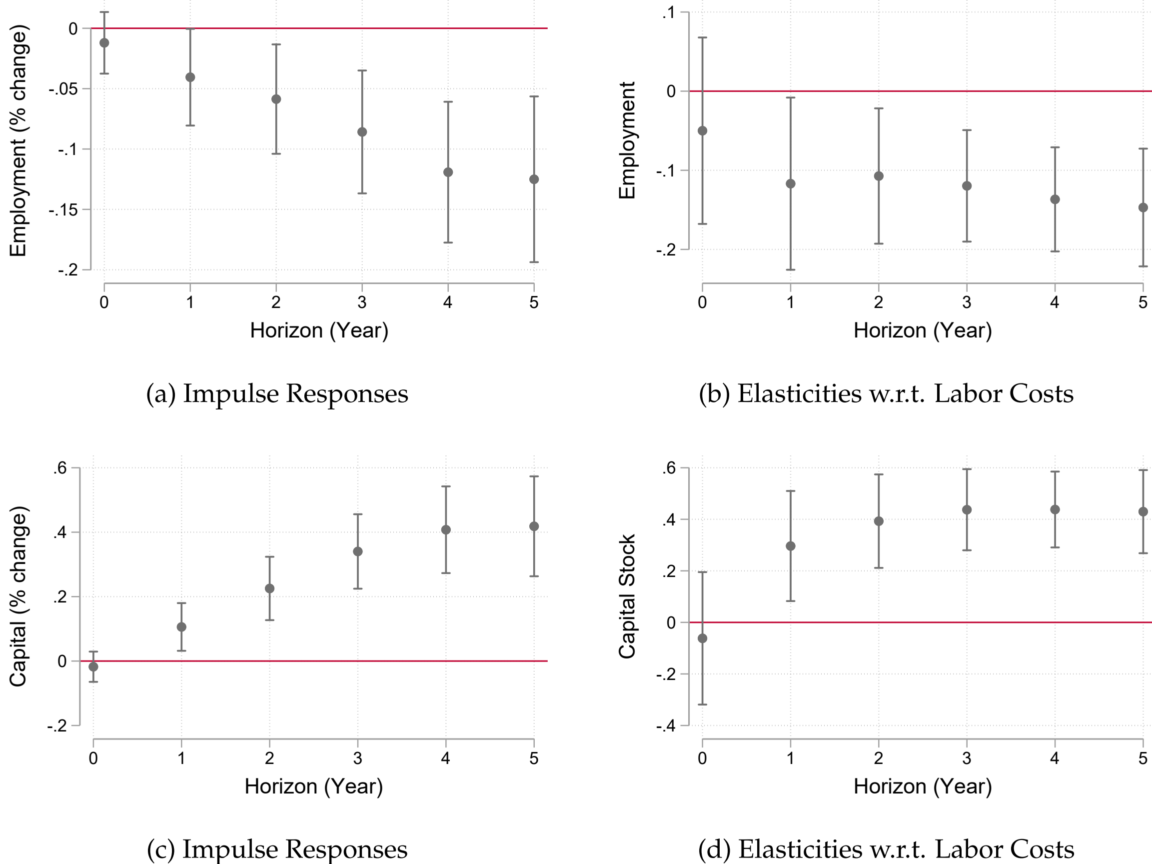
(b) Elasticities w.r.t. Labor Costs

Notes: Figure on the left shows the response to a one percent point increase the compliance cost to the minimum wage, computed using equation (1), alongside 95 percent confidence intervals estimated using robust standard errors. Figure on the right shows the associated elasticity (percent change in the outcome variable due to one percent increase in the labor costs induced by the minimum wage) and 95 percent confidence intervals estimated using boostrapped standard errors

The declining magnitude of the elasticity is explained by firms implementing input demand adjustments as the horizon extends. As described in Figure 11, raising minimum wages cause firms to reduce their employment levels and increase their capital stock. Nevertheless, employment adjustment is relatively small. After the first year following the minimum wage change, the employment reduction materializes, and the associated elasticity stabilizes around -0.14. On the contrary, minimum wage exposure leads to greater capital adoption, with capital elasticities between 0.30 and 0.44. Despite the increase in capital-labor ratios, the minimum wage effects on the labor share are persistently positive in the longer-term. The small disemployment effects precisely explain such persistence. In the following chapter, I exploit these reduced-form estimates to compute

average and sector-specific elasticities of substitution between capital and labor. I find elasticities of substitution consistently below one, supporting that the substitution away from labor to capital is not large enough to reduce the labor share.

Figure 11: Minimum Wages, Employment and Capital Stock



(a) Impulse Responses

(b) Elasticities w.r.t. Labor Costs

(c) Impulse Responses

(d) Elasticities w.r.t. Labor Costs

Notes: Figures on the left shows the response to a one percent point increase the compliance cost to the minimum wage, computed using equation (1), alongside 95 percent confidence intervals estimated using robust standard errors. Figures on the right shows the respective elasticity (percent change in the outcome variable due to one percent increase in the labor costs induced by the minimum wage) and 95 percent confidence intervals estimated using boostrapped standard errors.

However, Costa Rica's multi-tier minimum wage system could explain the increase in the firm-level labor shares. Put differently, the labor shares may be mainly increasing due to firms adjusting the retribution to high-skilled labor in compliance with the policy. If that is the case, then this paper's external validity could be dampened, as almost all countries have a single-tier minimum wage setting. Table **??** shows the impulse response functions of the firm-level labor share to a change in the minimum wage across different occupation groups. Overall, all categories experience a positive impact. Still, low-skilled,

routinary, and non-routinary manual intensive groups experienced a more substantial effect.

Table 10: Labor Share Increase With Respect to Minimum Wage (Impulse Responses)

	Horizon (Year)					
	0	1	2	3	4	5
Labor Share	0.092*	0.211*	0.305*	0.417*	0.450*	0.439*
	(0.017)	(0.026)	(0.031)	(0.036)	(0.040)	(0.043)
			By Skill Level			
Low Skilled Occupations	0.153*	0.280*	0.410*	0.560*	0.604*	0.603*
	(0.024)	(0.038)	(0.047)	(0.053)	(0.061)	(0.066)
High-Skilled Occupations	0.066*	0.137*	0.197*	0.257*	0.213*	0.235*
	(0.024)	(0.037)	(0.046)	(0.053)	(0.060)	(0.067)
			By Task			
Routinary	0.101*	0.207*	0.305*	0.386*	0.388*	0.405*
	(0.025)	(0.039)	(0.048)	(0.056)	(0.063)	(0.071)
Non-Routine Manual	0.121*	0.225*	0.378*	0.434*	0.488*	0.418*
	(0.041)	(0.067)	(0.084)	(0.099)	(0.117)	(0.135)
Non-Routine Analytical	0.061*	0.098*	0.161*	0.193*	0.210*	0.192*
	(0.030)	(0.047)	(0.058)	(0.066)	(0.076)	(0.084)

Notes: Percentage increase in the labor share associated with intial one p.p increase in the wage bill necessary to comply with the new minimum wages. Robust standard errors in parenthesis

5.2 Minimum Wages and Firm-Level Employment

One primary source of concern around raising minimum wages is the unintended consequences in terms of employment. As explained by Manning (2021), up until recently, there was a prominent academic consensus that minimum wages cause job losses. Nonetheless, recent research suggests that raising minimum wages has negligible employment effects.[19] Still, most of this empirical literature focuses on countries where the minimum wage is set substantially low relative to prevailing wages. Such a context implies that (i) firm responses are hard to detect and (ii) the policy reaches only specific sectors such as fast-food industries and teen workers. Therefore, the lack of significant firm responses found in several papers, including employment, could not be valid for other economies with a binding minimum wage. For instance, Cengiz et al. (2019) affirm that minimum wages up to 60 percent of the median wage have negligible employment effects.

Costa Rica's context, therefore, constitutes a case of study of an economy in which minimum wages are more restrictive. Its multi-tier system, additionally, allows incorpo-

[19]See Dube (2019a), Neumark (2019) for a literature review

rating different sectors and firms with varying technologies of production. Yet, as discussed above, the employment adjustment is relatively small, even in the longer term. The estimated elasticity converges around -0.147 in the longer term, in line with the bulk of recent estimates (Dube, 2019b). But as mentioned before, the effect could be affected by firms being exposed to the policy through high-skilled minimum wages. Table **??** shows the estimated employment elasticities across different occupational groups. Overall, all groups exhibit relatively small elasticities. Low-skilled occupations (-0.179) and routinary occupations (-0.193) face a stronger adjustment. At the same time, high-skilled and non-routine analytical groups do not experience a significant impact at all. Therefore, the employment adjustment implemented by firms relies on workers that are more susceptible to technology substitution.

Table 11: Employment Elasticities

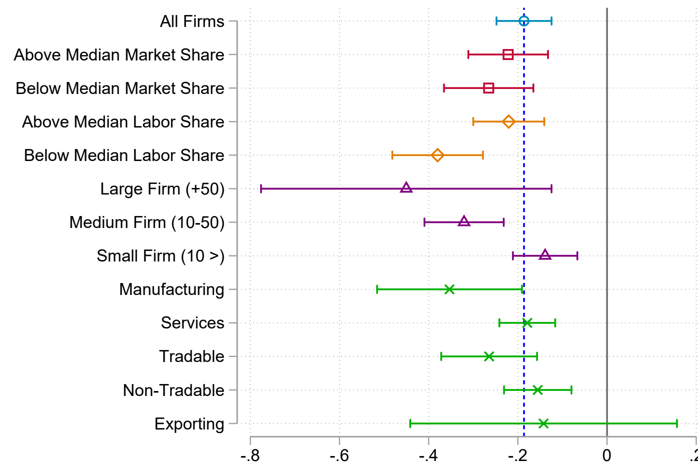
	Horizon (Year)					
	0	1	2	3	4	5
Employment	-0.050	-0.117	-0.107	-0.120	-0.137	-0.147
	(0.060)	(0.056)	(0.044)	(0.036)	(0.034)	(0.038)
	By Occupation Skill					
Low Skilled Occupations	-0.029	-0.151	-0.109	-0.152	-0.157	-0.179
	(0.071)	(0.068)	(0.053)	(0.047)	(0.045)	(0.049)
Medium-Skilled Occupations	-0.058	-0.100	-0.095	-0.106	-0.096	-0.111
	(0.075)	(0.077)	(0.047)	(0.053)	(0.048)	(0.055)
High-Skilled Occupations	-0.058	-0.077	-0.064	-0.063	-0.057	-0.036
	(0.067)	(0.074)	(0.058)	(0.051)	(0.049)	(0.056)
	By Occupation Task					
Routinary	-0.054	-0.160	-0.127	-0.136	-0.161	-0.193
	(0.067)	(0.074)	(0.058)	(0.053)	(0.049)	(0.055)
Non-Routine Manual	-0.054	-0.148	-0.120	-0.109	-0.103	-0.116
	(0.079)	(0.077)	(0.060)	(0.051)	(0.051)	(0.059)
Non-Routine Analytical	-0.012	-0.020	-0.053	-0.067	-0.061	-0.076
	(0.092)	(0.105)	(0.073)	(0.064)	(0.061)	(0.072)

Notes: Percentage change in employment level due to a one percent increase in the labor costs induced by the minimum wage. Bootstrapped standard errors in parenthesis

Figure 12 explores heterogeneity across sectors and firm groups. Altogether, elasticities do not vary substantially, but there are some intriguing differences. Firms with market shares below the median and with labor shares above the median display higher elasticities. Similarly, large firms, manufacturing units, and those operating in tradable sectors have relatively larger employment elasticities. Such a pattern reflects that firms in which labor is somewhat less important and have more capacity to automatize the

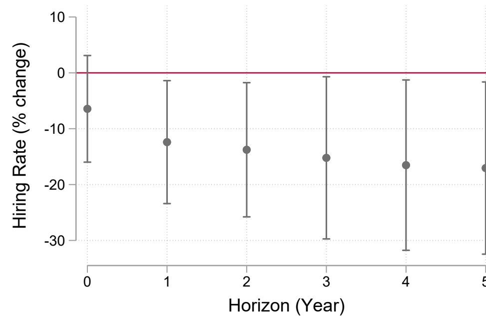
production process implement stronger employment cuts.

Figure 12: Employment Elasticity w.r.t. Labor Costs



Despite the slight adjustment in employment levels, firms do experience a considerable reduction in hiring rates. Figure 13 shows the impulse response to a one p.p. increase in the labor costs associated with the minimum wage. Firms persistently decline their hiring rates in response to the policy change. The magnitude of the reduction starts at 12 percent and converges around 17 percent. Since capital adoption increases in response to the policy, these results suggest that higher labor costs due to minimum wages induce firms to grow through capital expansion. In other words, even though firms do not cut employment significantly, they reduce new incorporations as labor becomes relatively more expensive due to the minimum wage policy. Chapter 3 discusses how the decline in job creation and a reduction in startup activity have sizeable consequences on employment dynamics.

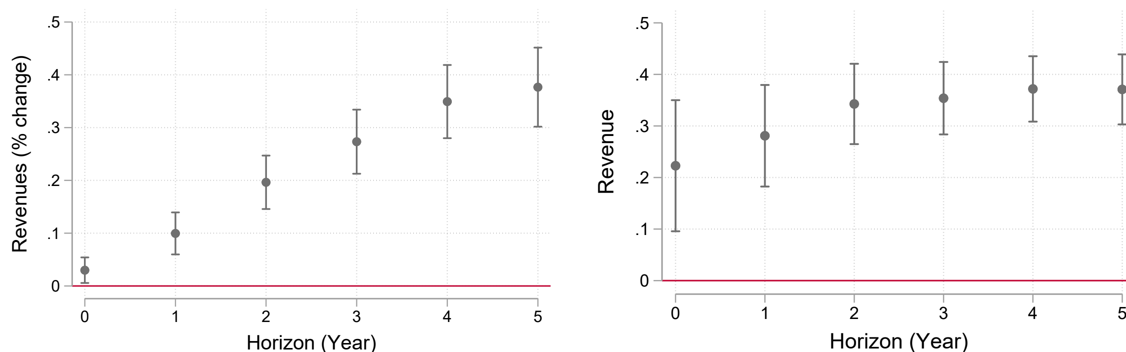
Figure 13: Impulse Response of Hiring Rates



5.3 Minimum Wages and Other Firm Margins

In this section, I analyze other firm margins that are key to understand firm behavior after a minimum wage increase, such as revenues, production reallocation, productivity, profitability, and firm exit. Furthermore, recent literature has provided mixed evidence on these variables. Future work is oriented to dig deeper into these margins to explore other mechanisms through a structural analysis lens.

Figure 14: Minimum Wages and Revenues



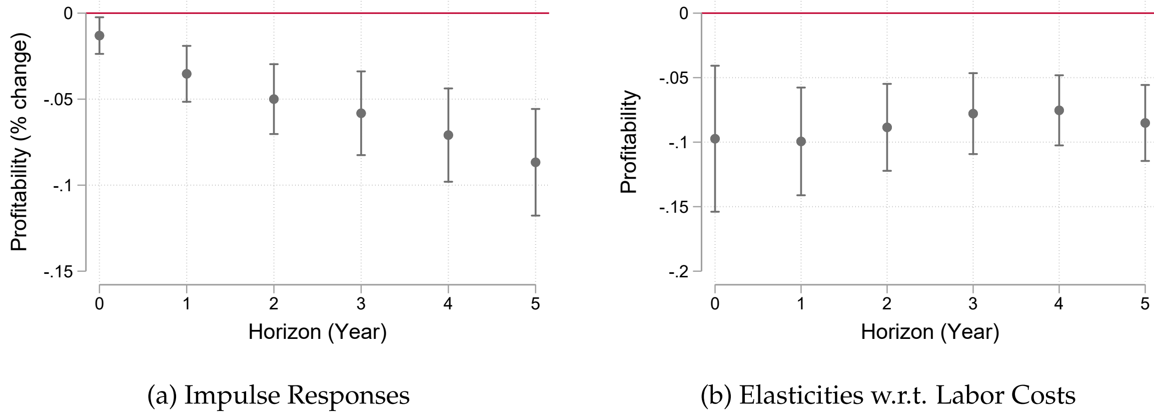
(a) Impulse Responses

(b) Elasticities w.r.t. Labor Costs

Notes: Figures on the left shows the response to a one percent point increase the compliance cost to the minimum wage, computed using equation (1), alongside 95 percent confidence intervals estimated using robust standard errors. Figures on the right shows the respective elasticity (percent change in the outcome variable due to one percent increase in the labor costs induced by the minimum wage) and 95 percent confidence intervals estimated using boostrapped standard errors.

Figures 14 show that firm-level revenues increase in response to a minimum wage change, with an elasticity starting around 0.25 and converging around 0.35. Nevertheless, the increase in revenues is insufficient to halt a decline in profitability. Figure 15 presents a negative response of firm profitability that persists over time. Such a response emphasizes the policy's redistributional nature: raising the minimum wage leads to a transfer of rents from firms (lower profits) to workers (higher labor shares).

Figure 15: Minimum Wage Effects on Firm Profitability



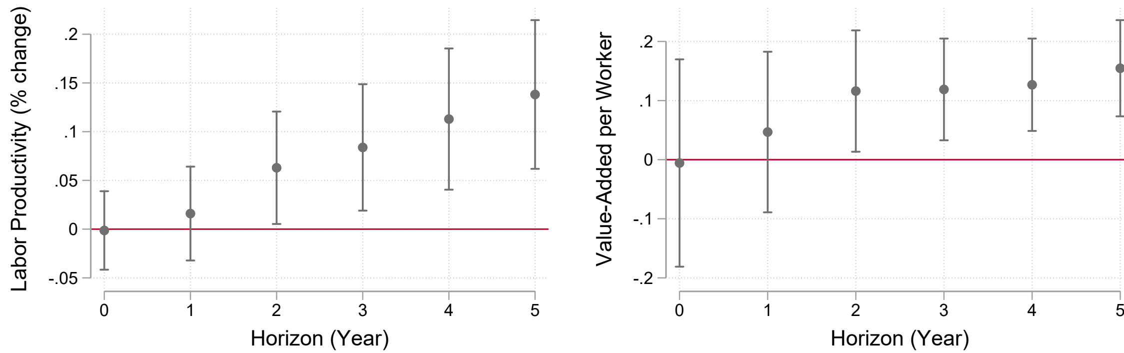
(a) Impulse Responses

(b) Elasticities w.r.t. Labor Costs

Notes: Figures on the left shows the response to a one percent point increase the compliance cost to the minimum wage, computed using equation (1), alongside 95 percent confidence intervals estimated using robust standard errors. Figures on the right shows the respective elasticity (percent change in the outcome variable due to one percent increase in the labor costs induced by the minimum wage) and 95 percent confidence intervals estimated using boostrapped standard errors.

In the absence of firm-level price data, revenue responses are informative on the extent to which exposed firms increase prices to absorb higher labor costs. Under the neoclassical perspective of a perfectly competitive product and labor markets, higher minimum wages induce firms to reduce employment and, therefore, output. However, if firms have some degree of market power, they can increase prices without affecting revenues in compliance with the policy (Aaronson (2001); Aaronson and French (2007); Harasztosi and Lindner (2019)). Alternatively, firms can implement productivity improvements by adopting better managerial practices (Hau et al., 2020) or as workers perform better due to higher wages (Coviello et al., 2018). Figure 16 in fact displays productivity improvements for exposed firms.

Figure 16: Minimum Wages and Labor Productivity

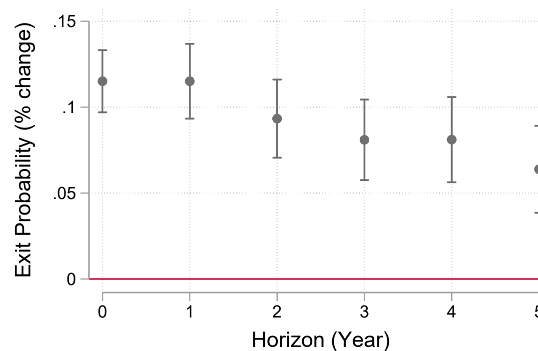


(a) Impulse Responses (b) Elasticities w.r.t. Labor Costs

Notes: Figures on the left shows the response to a one percent point increase the compliance cost to the minimum wage, computed using equation (1), alongside 95 percent confidence intervals estimated using robust standard errors. Figures on the right shows the respective elasticity (percent change in the outcome variable due to one percent increase in the labor costs induced by the minimum wage) and 95 percent confidence intervals estimated using boostrapped standard errors.

Similarly, if the policy causes firms to exit the market, surviving firms can increase their market shares, preventing them from making more substantial job cuts. As discussed before, raising the minimum wage leads to a persistent decline in firm profitability, which is unlikely bearable for low productive units. Figure **??** shows the impulse response of the probability of exit, describing that the probability decreases as the horizon extends, consistent with firms implementing changes to survive. Given average exposure in 2007, minimum wages increase exit rates between 6.7 (first year after the change in the minimum wage) and 2.5 percent.

Figure 17: Minimum Wage Impact on Firm Exit



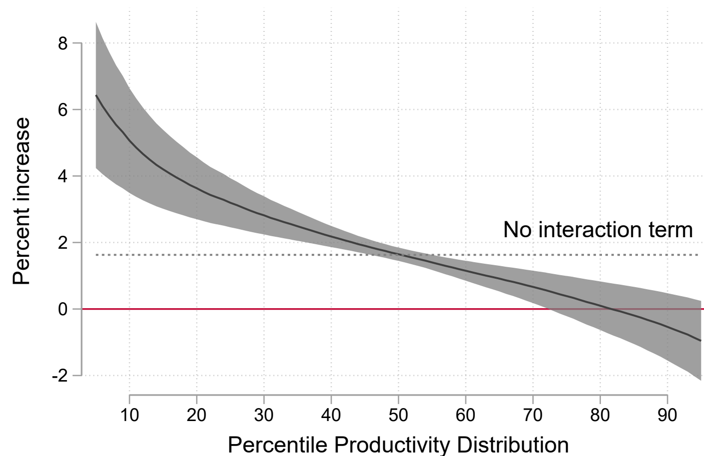
Notes: Figure shows the percentage increase in the probability of exit associated to one percent increase in minimum wage exposure, alongside 95% confidence intervals estimated from robust standard errors.

To explore heterogeneity in firm exit, I consider the following regression:

$$Exit_{jt} = \beta \times Exposure_{jt} + \beta_2 \times Exposure_{jt} \times Productivity_j + \alpha \times Productivity_j + \gamma X_j + \nu_{st} + u_{jt}$$

Where the variable $Productivity_j$ is the productivity level of the firm (value-added per worker) in the 2006-2007 period. The coefficient of interest, in this case, corresponds to β_2. If $\beta_2 < 0$, then low-productive firms face a disproportionately higher chance of exit the market as minimum wages increase. Figure 18 displays the regression results evaluated at different points of the productivity distribution. Firms in the bottom first decile face, on average, three times higher probability of exit than the average effect. Hence, these results indicate that low productive firms are pushed out of the market after a minimum wage raise.

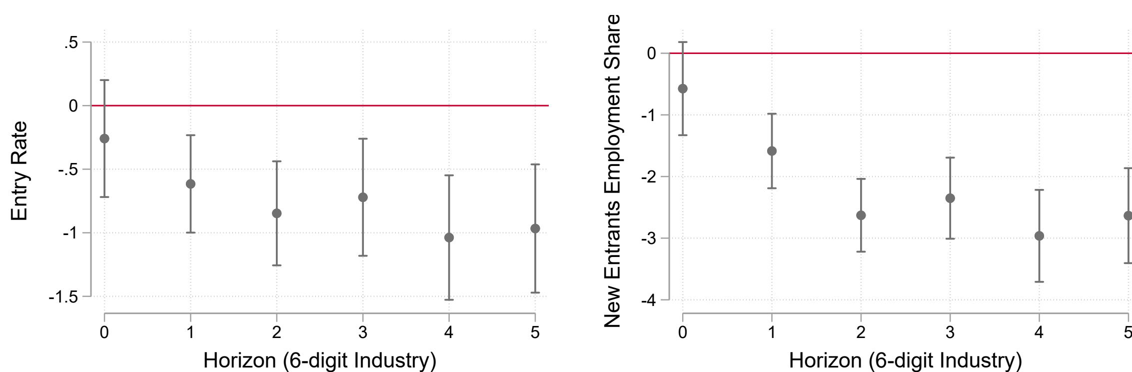
Figure 18: Increase in Exit Probability Associated with Minimum Wage Exposure



5.4 Minimum Wages and Firm Entry

Next, I focus on the minimum wage incidence on firm entry. As discussed in Section 4, I aggregate the data to 4, 5, and 6-digit ISIC industry levels to conduct the regression analysis specified in equation (2). Table 12 summarizes the main results, and Figure 19 illustrates the dynamic responses for the 6-digit aggregation. I consider two measures of firm entry. The first one is the entry rate (share of new employers as a fraction of all employers). The second one is the startup or new entrants' employment share (employment at age 0 firms as a fraction of all private sector employment). The former variable hence measures both the number and the size of new entrants.

Figure 19: Minimum Wage Exposure and Firm Entry



Notes: Figures show the percent change in the entry rate associated to a one percent point increase the compliance cost to the minimum wage, computed using equation (2), alongside 95 percent confidence intervals estimated using robust standard errors. Regressions include industry-level controls and 2-digit industry and year dummies.

Overall, the estimation results establish that raising the minimum wage has a negative and long-lasting effect on business creation. The magnitude of the impact is relatively robust across the different aggregation levels. The policy's effect is not immediate, as it takes a year after the minimum wage adjustment to turn significant. Moreover, the coefficient associated with the startup employment share is larger than the one for the entry rate, which implies that the policy has an additional adverse impact on the entering firms' size. A one percentage point in the industry level's compliance cost leads to a decline in entry rates between 0.89 and 0.97 percent. The impact escalates to 2.6-3.0 percent for the startup employment shares.

Table 12: Minimum Wages and Firm Entry Rate Changes

	Horizon (Year)					
	0	1	2	3	4	5
	4-Digit ISIC Industry Codes					
Entry Rate	-0.347	-0.825*	-0.898*	-0.698*	-0.892*	-0.898*
	(0.238)	(0.198)	(0.216)	(0.245)	(0.266)	(0.263)
Startup Employment Share	-0.868*	-2.21*	-2.68*	-2.661*	-3.404*	-3.015*
	(0.410)	(0.315)	(0.306)	(0.345)	(0.395)	(0.396)
Observations	1,507	1,370	1,233	1,096	959	822
F-Statistic	2,166.8	1,493.3	172.4	130.0	92.3	65.6
Overidentification Test	[0.664]	[0.92]	[0.409]	[0.655]	[0.78]	[0.795]
	5-Digit ISIC Industry Codes					
Entry Rate	-0.332	-0.772*	-0.826*	-0.681*	-0.785*	-0.899*
	(0.232)	(0.193)	(0.213)	(0.239)	(0.260)	(0.257)
Startup Employment Share	-0.706	-1.898*	-2.484*	-2.341*	-2.738*	-2.705*
	(0.381)	(0.305)	(0.300)	(0.338)	(0.381)	(0.386)
Observations	2,079	1,890	1,701	1,512	1,323	1,134
F-Statistic	2,311.3	1,592.8	183.9	138.7	98.5	70.0
Overidentification Test	[0.42]	[0.752]	[0.088]	[0.411]	[0.207]	[0.117]
	6-Digit ISIC Industry Codes					
Entry Rate	-0.259	-0.616*	-0.847*	-0.721*	-1.038*	-0.966*
	(0.235)	(0.195)	(0.209)	(0.235)	(0.250)	(0.257)
Startup Employment Share	-0.574	-1.586*	-2.629*	-2.351*	-2.963*	-2.635*
	(0.385)	(0.308)	(0.301)	(0.336)	(0.381)	(0.393)
Observations	2,574	2,340	2,106	1,872	1,638	1,404
F-Statistic	2,359.4	1,626.0	187.8	141.6	100.5	71.4
Overidentification Test	[0.598]	[0.932]	[0.264]	[0.121]	[0.088]	[0.313]

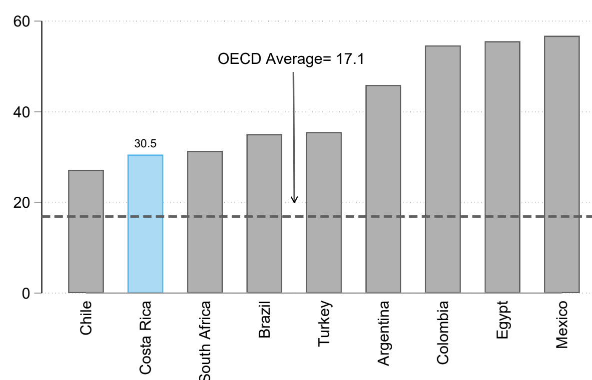
Notes: Table shows the percent change of startup (entry) rates and startup employment shares (fraction of total employment in age 0 firms) to one p.p. increase in minimum wage exposure at the industry level, following equation (2). Robust standard errors in parenthesis. Overidentification test reports the p-value (in brackets) for the null hypothesis that the instruments are valid (no misspecification). * $p<0.05$

In Section 6 I discuss in full detail the dynamic implications of less startup activity on aggregate employment.

5.5 Informal Sector

One important limitation in this study is that the data restricts to the formal sector. Although Costa Rica has a large informal economy by OECD standard, as described in Figure 20, the informal sector is relatively smaller than other middle-income countries.

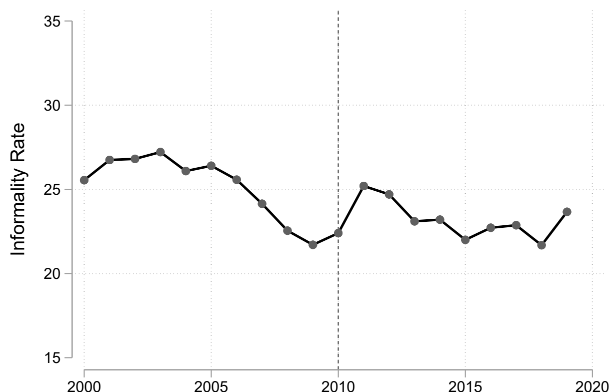
Figure 20: Informality Rates, 2016



Notes: Informality defined by OECD to include workers not paying social security contributions or whose business is not registered. Unweighted average of informality rates for 24 OECD countries (Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Latvia, the Netherlands, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, the United Kingdom).
Source: OECD

Higher minimum wages could motivate firms to operate informally, which may posit an identification threat to the extent that a substantial mass of firms and workers transition to the informal market. Figure 21 shows the evolution of labor informality rates between 2000 and 2019, defined as workers whose employers do not directly pay Social Security taxes and, therefore, would not appear in the administrative datasets used in this research. Overall, there is no clear evidence of an expanding informal sector, despite the minimum wage increase. According to OECD (2017, 2018), before 2004 and 2010, informality followed a downward trend due to subsidized social insurance payments for self-employed workers.

Figure 21: Informality Rates



Notes: Fraction of employed workers in the informal sector. Horizontal line denotes a methodological change in the household surveys
Source: National Institute of Statistics and Census (INEC)

The lack of firm-level information on the informal market introduces some measurement error in firm entry and exit. The negative impact on entry could be overstated if startups start operating in the informal sector in response to higher minimum wages. However, the absence of an upward trend in informality rates, as shown in Figure 21, suggests that such behavior is limited. Similarly, firms leaving the formal market to operate in informality could overstate the estimated positive impact on firm exit associated with the minimum wage. Table 13 shows the main characteristics of entering and exiting firms between 2007 and 2017. There is no clear pattern of a change in the size or labor share of entering and exiting firms indicating that the informal market is a significant factor driving the results.

Table 13: Average Employment and Revenues for Entering and Exiting Firms

	Employment		Log Revenues	
	Entering	Exiting	Entering	Exiting
2006	7.1	7.8	17.9	18.0
2007	6.4	7.0	18.1	18.0
2008	6.6	6.8	18.0	18.0
2009	6.4	6.3	17.9	18.0
2010	5.8	6.2	17.9	17.9
2011	6.2	6.3	18.0	18.0
2012	6.3	6.3	18.0	18.0
2013	7.0	6.2	18.0	18.0
2014	7.3	7.3	18.0	18.1
2015	6.6	6.3	18.0	18.1
2016	6.5	5.6	18.1	18.1
2017	6.5	7.3	17.9	18.1

Notes: Table shows the average employment (number of workers) and revenues (log millions 2020 CRC) for firms entering and exiting the administrative datasets.

Besides, the Ministry of Labor and Social Security implemented a comprehensive program to increase compliance with legal minimum wages between 2010 and 2014 (National Campaign for Minimum Wages). Gindling et al. (2015) evaluated the campaign's effectiveness, finding an increase in compliance, and no evidence of a negative impact on full-time workers' employment. Moreover, the authors suggest that the campaign positively impacted the probability that workers would receive other nonwage benefits, such as social security. For this paper, this would indicate an improvement in the quality and coverage of the administrative datasets.

5.6 Robustness

Tables 14 and 15 provide a first set of robustness exercises for the results from estimating equation (1). Column 1 shows the baseline estimation. Columns 2 and 3 include one and two lags of minimum wage exposure, accounting for lagged minimum wage adjustments. Column 4 restricts to a balanced panel, exploring for compositional changes that could be driving the longer-term responses. Overall, the point estimates do not show strong difference between the specifications.

Table 14: Dynamic Responses Under Different Specifications

	Baseline (1)	One Lag (2)	Two Lags (3)	Balanced (4)
	Wagebill			
1	0.358*	0.355*	0.365*	0.457*
	(0.021)	(0.021)	(0.024)	(0.024)
Obs	120,310	117,460	102,474	105,719
3	0.783*	0.783*	0.757*	0.818*
	(0.031)	(0.031)	(0.036)	(0.032)
Obs	85,657	76,322	71,878	81,835
5	0.998*	1.011*	1.037*	0.998*
	(0.040)	(0.041)	(0.054)	(0.040)
Obs	57,805	47,353	46,667	57,805
	Employment			
1	-0.041*	-0.042*	-0.045	-0.001
	(0.020)	(0.020)	(0.025)	(0.023)
3	-0.086*	-0.087*	-0.097*	-0.087*
	(0.026)	(0.026)	(0.031)	(0.027)
5	-0.125*	-0.122*	-0.121*	-0.125*
	(0.035)	(0.035)	(0.043)	(0.035)
	Capital			
1	0.106*	0.111*	0.159*	0.158*
	(0.038)	(0.038)	(0.045)	(0.046)
3	0.340*	0.340*	0.417*	0.387*
	(0.059)	(0.059)	(0.071)	(0.062)
5	0.418*	0.428*	0.576*	0.418*
	(0.079)	(0.080)	(0.102)	(0.079)

Notes: Table shows estimated coefficients following equation (1). Columns 2 and 3 include one and two lags of minimum wage exposure. Column 4 restricts to a balanced panel. Robust standard errors in parenthesis.

Table 15: Dynamic Responses Under Different Specifications (Cont.)

	Baseline (1)	One Lag (2)	Two Lags (3)	Balanced (4)
	Revenues			
1	0.100*	0.097*	0.123*	0.169*
	(0.020)	(0.020)	(0.025)	(0.023)
3	0.273*	0.273*	0.269*	0.311*
	(0.031)	(0.031)	(0.036)	(0.032)
5	0.377*	0.385*	0.378*	0.377*
	(0.038)	(0.039)	(0.052)	(0.038)
	Profitabilitly			
1	-0.035*	-0.035*	-0.041*	-0.040*
	(0.008)	(0.008)	(0.010)	(0.009)
3	-0.058*	-0.058*	-0.058*	-0.065*
	(0.012)	(0.012)	(0.014)	(0.013)
5	-0.087*	-0.089*	-0.101*	-0.087*
	(0.016)	(0.016)	(0.020)	(0.016)
	Firm Exit			
1	0.115*	0.114*	0.103*	0.032*
	(0.011)	(0.011)	(0.013)	(0.008)
3	0.081*	0.081*	0.093*	0.043*
	(0.012)	(0.012)	(0.014)	(0.010)
5	0.064*	0.064*	0.074*	0.064*
	(0.013)	(0.013)	(0.016)	(0.013)

Notes: Table shows estimated coefficients following equation (1). Columns 2 and 3 include one and two lags of minimum wage exposure. Column 4 restricts to a balanced panel. Robust standard errors in parenthesis.

6 Aggregate Implications

This section discusses some aggregate implications associated with Costa Rica's minimum wage policy. First, I estimate the policy's impact on the aggregate labor share, accounting for the intensive (surviving firms), and extensive margin effects (entry and exit). Second, I quantify the dynamic employment effects of less firm entry induced by the minimum wage.

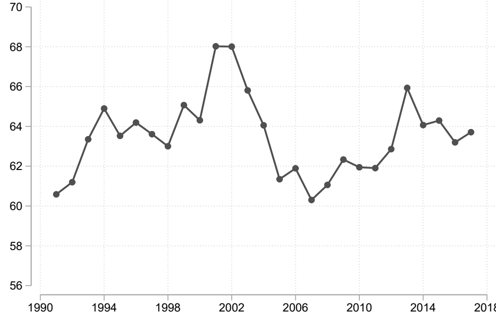
6.1 Minimum Wage Effects on The Aggregate Labor Share

As shown before, minimum wages induce surviving firms to increase their labor shares. However, the policy also leads to firm exit and discourage business creation. This section

estimates the minimum wage effects on the aggregate labor share, accounting for both the policy's intensive and extensive margin effects.

First, Figure 22 plots the evolution of Costa Rica's aggregate labor share. Between 2007 and 2017, the aggregate labor share increased around 3.4 p.p, from 60.3 to 63.7 percent.

Figure 22: Costa Rica: Aggregate Labor Share



Source: LAKLEMS

Let λ_{2017} the aggregate labor share in 2017, the final year of analysis. Let $\Delta\lambda_{2017} = \lambda_{2017} - \lambda_{2007}$, the change in the labor share between 2007 and 2017. Then, based on the Melitz-Polanec decomposition (Melitz and Polanec, 2015) and recent labor share literature exploiting it to conduct labor share analysis (e.g., Kehrig and Vincent (Forthcoming); Autor et al. (2020)), define :

$$\frac{\Delta\lambda_{2017}}{\lambda_{2007}} = \underbrace{\sum_{j \in S} \omega_j \times Exposure_j \times \varepsilon^{LS}_{MW}}_{Surviving} + \underbrace{\omega_X \times \Delta r^{MW}_{exit} \times \left(\frac{\bar{\lambda}_S - \bar{\lambda}_X}{\bar{\lambda}}\right)}_{Exit} + \underbrace{\omega_E \times \Delta r^{MW}_{entry} \times \left(\frac{\bar{\lambda}_E - \bar{\lambda}_S}{\bar{\lambda}}\right)}_{Entry} \quad (3)$$

where subscript S denotes survivors, subscript X denotes exiters and subscript E denotes entrants. The first component of the equation (3) captures the policy's effect on surviving firms, discussed in Section 5.1. ω_j is the firm j's average value-added share and, $Exposure_j$ the average minimum wage exposure in 2007-2017. ε^{LS}_{MW} corresponds to the estimated minimum wage effect on firm-level labor shares. The second component measures the minimum wage effect on the labor share through the exit channel. Specifically, ω_X is the average value-added share of exiting firms during the 2007-2017 period, Δr^{MW}_{exit}

the estimated policy's effect on firm exit discussed in Section **??** and the $\left(\frac{\bar{\lambda}_S - \bar{\lambda}_X}{\bar{\lambda}}\right)$ denotes the relative type of exiting firms. Since firms leaving the market have, on average, 10.4 percent higher labor shares than surviving firms, then the policy has a negative impact on the aggregate labor share through the exit margin. Lastly, the last term accounts for the minimum wage effects on firm entry. ω_E denotes the average value-added share of new entrants, and Δr^{MW}_{entry} the estimated policy's effect on firm entry discussed in Section 5.4. The $\left(\frac{\bar{\lambda}_E - \bar{\lambda}_S}{\bar{\lambda}}\right)$ component denotes the relative type of entering firms. Since entering firms have, on average, 8.2 percent higher labor shares than surviving firms, then the minimum wage policy negatively impacts the aggregate labor share through the entry margin. To estimate the change in the aggregate labor share, I consider the long-term firm and industry level responses to minimum wage exposure (see Tables 8 and 12) and the estimated effect considering as the dependent variable the cumulative change in the relevant firm outcomes between 2007 and 2017.[20]

Table 16 reports the results. The policy's impact on surviving firms dominates and translates to a labor share increase between 1.24 and 2.59 percent. However, such an effect is moderated by the policy's incidence on firm entry and exit. The entering component contributed negatively to the aggregate labor share change by 0.014-0.030 percent. Similarly, the firm exiting component negatively impacted the aggregate labor share, with an effect between 0.026 and 0.054 percent. Altogether, the minimum wage increased the aggregate labor share between 1.2 and 2.5 percent, i.e., between 0.72 and 1.51 p.p. This represents between 21.1 and 44.3 percent of the 2007-2017 change documented in Figure 22.

Table 16: Aggregate Labor Share Percent Change (2007-2017)

	(1)	(2)
Surviving Firms	1.235	2.588
Entering Firms	-0.014	-0.030
Exiting Firms	-0.026	-0.054
Total	1.195	2.504

Notes: Table shows the percent increase in the aggregate labor share associated with the minimum wage policy, following equation (3). Column 1 uses the estimated long-term responses responses (see Tables 8 and 12) and Column 2 the results of considering the cumulative 2007-2017 change as the dependent variable.

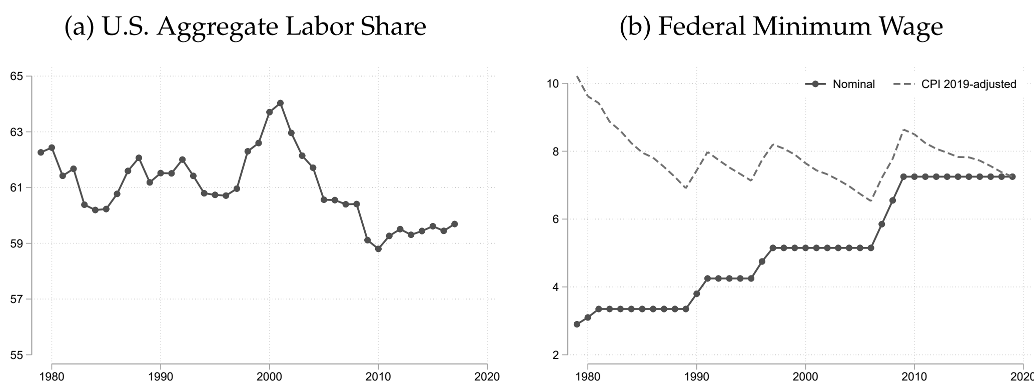
[20]Specifically, I estimate the regression $\ln Y_{j,2017} - \ln Y_{j,2007} = \alpha_h + \beta Exposure_{j,2007} + \gamma_h X_j + \nu_s + u_j$.

6.1.1 U.S. Labor Share and Minimum Wages

The decline in the U.S. labor share has fueled extensive literature addressing numerous explanations to explain the downward trend. Although related research has proposed other factors as the main contributors of such a trend,[21] the minimum wage has played an active role in this discussion.The real value of the federal minimum wage in 2019 (US$7.25) was 14.2 percent less than when it was last raised in 2009 and 28.6 percent below its peak value in 1968 (see Figure 23). Academic and policy research has proposed the minimum wage as a policy response to increase the labor share (e.g., Piketty (2015); Council of Economic Advisers (2016)).

Figure 23: U.S. Labor Share and Federal Minimum Wage

(a) U.S. Aggregate Labor Share (b) Federal Minimum Wage

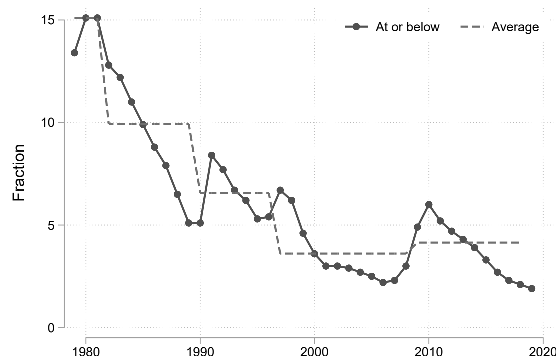


Source: U.S. Bureau of Labor Statistics.

To illustrate how the U.S. minimum wage evolution has contributed to the declining labor share and emphasize the importance of this paper's findings, I implement a simple back-of-the-envelope calculation. I consider a scenario in which the federal minimum wage kept up with inflation to maintain the 1979's level (US$2.9 nominal, US$10.2 real). Consequently, the nominal federal minimum wage in 2017 would be US$9.79 instead of the actual US$7.25. Additionally, I assume that only the workers earning at or below the minimum wage would be affected, ruling out spillover effects.

[21] See Elsby et al. (2013); Karabarbounis and Neiman (2014); Kehrig and Vincent (Forthcoming); Autor et al. (2020) for a discussion on the main forces explaining the U.S. labor share decline.

Figure 24: Workers Earning At or Below the Federal Minimum Wage



Source: U.S. Bureau of Labor Statistics.

Table 17 shows the percentage increase in the labor share if the federal minimum wage would have kept is real value since 1978. Column 1 assumes the exact trend in the fraction of minimum wage workers described in Figure 24. Column 2 fixes the proportion of minimum wage workers at 6 percent for the entire analysis (the average between 1979 and 2019). Column 3 considers the average of the fraction of minimum wage workers between the federal level changes (dashed line in Figure 24). Overall, the labor share would be between 0.7 and 1.5 percent higher than the reported levels.[22]

Table 17: Percent Increase in U.S. Labor Share Under a Stable Real Minimum Wage

	(1)	(2)	(3)
1979-1989	1.25	0.85	1.45
1990-1999	1.24	1.21	1.17
2000-2009	0.71	1.44	0.87
2010-2017	0.65	1.01	0.70

Notes: Table shows the percent increase in the aggregate U.S. labor share if the Federal minimum wage would kept its 1978 value and assuming only workers earning at or below the minimum wage would be affected. Column 1 considers the actual fraction of workers earning at or below. Column 2 fixes a 6 percent of workers for all years (average 1978-2017). Column 3 considers the average of the fraction of minimum wage workers between the minimum wage adjustments.

I further consider the impact of increasing the federal minimum wage to US$12 and US$15, using the current federal level and assuming a proportion of 4.14 percent of workers earning at or below the minimum wage (average 2009-2017). In this case, the labor share would increase 1.6 and 2.6 if the federal minimum wage increases to US$12 and US$15, respectively.

[22]The effect on the labor share would be the aggregate labor share $\times$ fraction of minimum wage workers $\times$ percent increase in the actual nominal minimum wage necessary to keep its real value constant.

6.2 Minimum Wages, Firm Entry and Aggregate Employment

I exploit the minimum wage policy to underline new entrants' relative importance in shaping aggregate employment dynamics. As discussed by Karahan et al. (2019), startups or age 0 firms are central elements of job creation. A decline in startup activity has dynamic consequences on aggregate employment by shifting the firm-age distribution of employment towards a more mature structure that, by nature, exhibit lower employment growth rates. I take the data and the results to a dynamic framework of aggregate employment developed by Pugsley and Şahin (2019). This model isolates the dynamic effects of startup activity and provides conditions to compute counterfactual levels compensating for the minimum wage's adverse effects on entry behavior.

Consider three main groups: startups, young firms y (1-10 years) and mature firms m (11 years and more). Let E_t^y, E_t^m and S_t the employment in young, mature and startups, respectively. Then, aggregate employment is $E_t = S_t + E_t^y + E_t^m$ and employment at each age group follows a law of motion:

$$\begin{aligned} E_t^S &= S_t \\ E_t^y &= \left(S_{t-1} + q_{t-1}^y E_{t-1}^y\right) x_t^y \left(1 + n_t^y\right) \\ E_t^m &= \left(\left(1 - q_{t-1}^y\right) E_{t-1}^y + E_{t-1}^m\right) x_t^m \left(1 + n_t^m\right) \end{aligned}$$

Where $q_{t-1}^y = \frac{\sum_{i=1}^{9} E_{t-1}^i}{E_{t-1}^y}$, denotes the fraction of age group y employment in year $t-1$ that remains in the y group in year t, x_t^y and $x_t^m$are the firm survival rates. n_t^y and n_t^m captures the conditional employment growth rate. Let $\mathbf{E}_t = \left(S_t, E_t^y, E_t^m\right)'$the employment distribution across the age groups. Hence, the law of motion of the employment distribution follows:

$$\begin{aligned} \mathbf{E}_t &= P_t' \mathbf{E}_{t-1} + (1,0,0)' S_t \\ \mathbf{E}_t &= \sum_{j=0}^{\infty} \left(\prod_{k=0}^{j-1} P_{t-k} \right) (1,0,0)' S_{t-j} \end{aligned} \tag{4}$$

Therefore, the employment distribution is shaped by entrant dynamics (S_t) and incumbent lifecycle dynamics (P_t). In particular, P_t is a transition matrix including survival rates (x_t^y, x_t^m) and conditional (on surviving) employment growth rates (n_t^y, n_t^m):

$$P_t \equiv \begin{bmatrix} 0 & x_t^y \left(1+n_t^y\right) & 0 \\ 0 & q_{t-1}^y x_t^y \left(1+n_t^y\right) & \left(1-q_{t-1}^y\right) x_t^m \left(1+n_t^m\right) \\ 0 & 0 & x_t^m \left(1+n_t^m\right) \end{bmatrix}$$

Then, a decline in new entrant activity drives a reallocation of employment towards incumbent firms, especially mature firms. If these incumbent firms exhibit slower growth rates, then employment growth would decline, expanding the effects of a decline in entry activity over time. More precisely, for the aggregate employment growth g_t, have:

$$g_t = \underbrace{s_{t-1}\left(1+g_t^s\right)}_{\text{Startup employment contribution}} + \underbrace{\left(1-\omega_{t-1}\right) g_t^y + \omega_{t-1} g_t^m}_{\text{Incumbent growth contribution}}$$

$$g_t = g_t^s \omega_t^s + (1-\omega_t^m) g_t^y + \omega_t^m g_t^m$$

Where $g_t^s = \frac{S_t}{S_{t-1}}$ is the gross rate, and ω_{t-1} measures the employment share of the current year t mature cohort in the previous year $t-1$:

$$\omega_{t-1} = \frac{E_{t-1}^m + \left(1-q_{t-1}\right) E_{t-1}^y}{E_{t-1}}$$

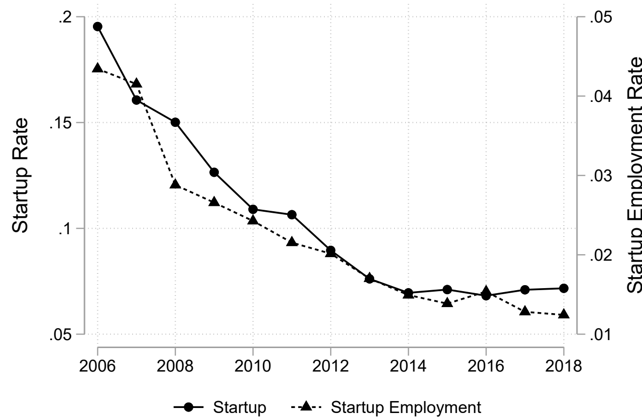
Then, aggregate employment dynamics are the result of the contribution of startups and incumbents. Furthermore, the incumbent contribution is both the combination of mature firm dynamics and young firms. Some of these young firms are precisely startups that survived their first year in the market. A startup deficit, then, has an immediate and direct impact on aggregate employment growth through g_t^s and, if $g_t^s \neq g_t^y \neq g_t^m$, it has a lagged and growing effect through increases in the incumbent mature employment share ω_{t-1} and declines in the startup employment share s_{t-1}.

I exploit equation (4) to isolate the adverse effects of the new entrants decline induced by the minimum wage on aggregate employment. I estimate the effect of minimum wages on startup employment based on equation (2). Afterward, I compute a counterfactual sequence of startup employment $\{S_t^c\}_{t\geq 2008}$, defined as the startup employment excluding the estimated effect from the minimum wage. Then, I compute $\mathbf{E}_t^c = \left(S_t^c, E_t^{y,c}, E_t^{m,c}\right)'$ by solving forward equation (4) and using the actual P_t observed from the data. Finally, I get E_t^c, the aggregate employment level without the minimum wage effect on startups, and assuming no change in survival and conditional growth rates for young and mature firms from adding the missing entrants. I will later show that the computed average growth rates in the transition matrix are relatively stable over the analyzed period. Since I am using the actual transition matrix P_t, I am not entirely shutting down the minimum wage

effects on aggregate employment as it could have some adverse impact on the incumbent margins. The counterfactual can be thought of as the economy we would have expected if the minimum wage did not decrease startups while other effects are still in place.

Similarly to the trend documented for the U.S. by recent empirical work (e.g., Haltiwanger et al. (2013); Decker et al. (2014); Pugsley and Şahin (2019)), Costa Rica also experienced a downward trend in the business creation rates, as highlighted by Figure 25.

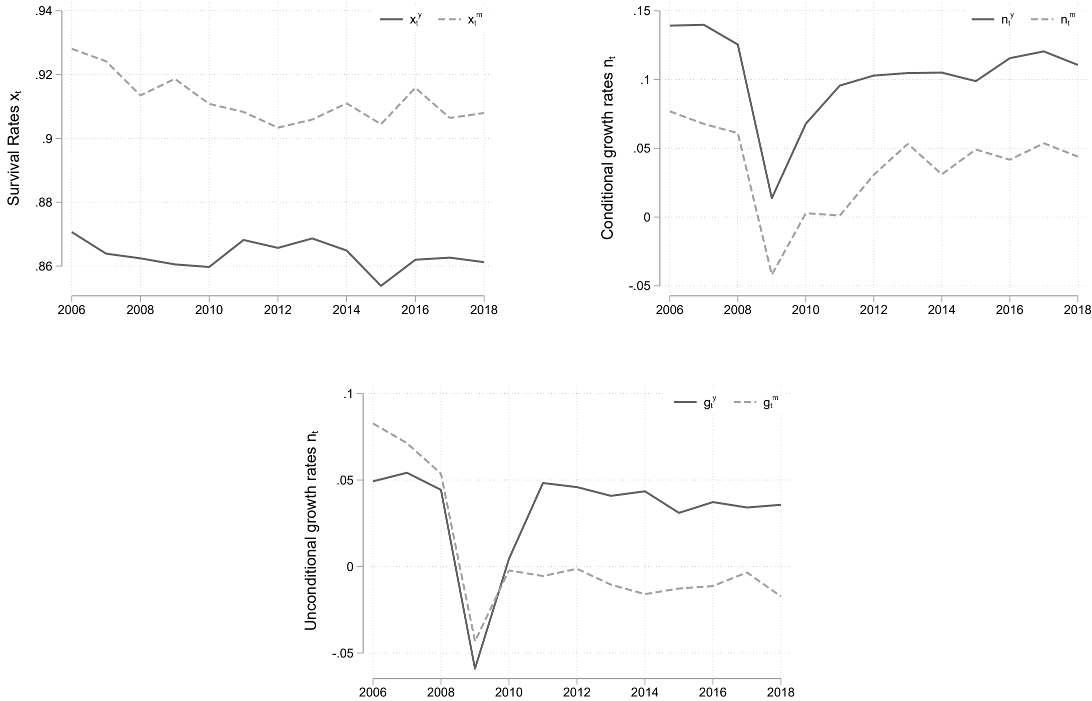
Figure 25: Startup Rates and Startup Employment Shares



Source: CR-LEED and REVEC

Figure 26 provides the main descriptive statistics on the survival and growth rates across the age groups. Consistent with related studies on firm dynamics, survival rates (x_t^y and x_t^m) are higher for mature firms and procyclical. Still, this rate is relatively stable along the analyzed period and for both the young and mature cohorts. Similarly, conditional on survival, mature firms exhibit lower employment growth rates (n_t^m), offsetting the lower survival rates observed for this age cohort. Both conditional rates are procyclical and, excluding the 2008-2010 period, the rates are stable. A similar dynamic pattern can be observed for the unconditional employment rates (g_t^y and g_t^m), as emphasized by Figure 26.

Figure 26: Minimum Wage Exposure and Firm Entry



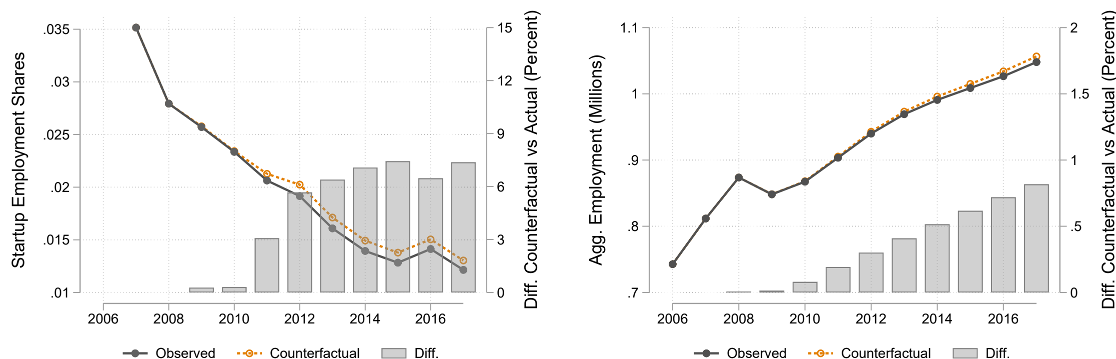
Notes: Figures show the survival rates x_t^a (fraction of young and mature firms that survived from the previous year), the conditional growth rates n_t^a (year-to-year growth rate of the cohort's average employment size) and the unconditional growth rates g_t^a (year-to-year employment growth rate within the age group).

Following the outlined strategy in Section 5, I exploit the results connecting exposure to the minimum wage and startup rates previously discussed to construct a sequence of the counterfactual startup employment rates. Taken 2006 and 2007 as given, I use the actual sequence of transition matrices P_t obtained from the data and the sequence of counterfactual startup employment shares $\{S_t^c\}_{t\geq 2008}$ to solve the model forward using equation (2). In other words, I construct a counterfactual economy in which the minimum wage did not have any incidence on entrants, while the survival and growth rates for young and mature firms do not change from what I empirically observe. Using the actual P_t is partially motivated by the stability in the average growth rates previously reported.

Figure 27 highlights the main results of this exercise. The first panel presents the observed and counterfactual startup employment shares, revealing that compensating for the missing entrants do not change the downward trend. By the end of the period, the difference between the startup employment levels and the counterfactual ones is around 7.3 percent, consistent with the regression results. The second graph shows the impact of the missing entrants due to the minimum wage. By the end of the period, employment

would be 0.8 percent higher than the reported levels if there was no adverse incidence coming from the minimum wage.

Figure 27: Counterfactual Analysis on Firm Entry and Minimum Wages



Notes: Figure on the left shows the observed and the counterfactual startup employment shares, estimated based on the results from equation (2) and the dynamic framework described in Section 5.

7 Conclusions

This paper uses rich administrative datasets to estimate the impact of minimum wages on firms. Costa Rica's distinctive occupation-based minimum wage setting and binding policy provide unique conditions for exploring alternative mechanisms. The policy's extensive coverage expands the analysis to economic sectors in which standard minimum wage policies would not be binding or would have a modest impact. The worker-level detail of the data and the administrative coverage on firms allow me to construct firm-level exposure measures and accurately identify firm entry and exit.

The paper shows that higher minimum wages induce firms to increase their labor shares (proportion of value-added paid to workers). The positive effect moderates as firms reduce their employment levels and raise their capital-labor ratios by expanding their capital stocks. Moreover, minimum wage increases hurt firm profitability, stressing the policy's redistributional implications. In other words, raising the minimum wage leads to a transfer of rents from firms (lower profits) to workers (higher labor shares). The paper also finds that firms increase their revenues and report labor productivity improvements, suggesting that the firm output does not significantly decline in response to the policy and supporting the estimated positive impact in the labor share.

Regarding business dynamics, this paper establishes that firm exit is an important adjustment channel for firms. The paper also documents that higher minimum wages

decrease the number and the size of new entrants. I exploit this incidence to emphasize the role of new firms in shaping aggregate employment dynamics. I find that aggregate employment is 0.8 percent lower due to the missing entrants induced by the policy. Put differently, raising the minimum wage has negative and dynamic implications for aggregate employment by deterring firm creation.

This paper provides valuable information for the vigorous debate around the minimum wage. As shown by the paper, the policy's incidence is multidimensional. Policymakers and academics should not restrict the discussion solely to the disemployment effects. Moreover, policymakers must recognize that labor market regulation, such as minimum wages, represents a burden to firms and a higher entry barrier for startups. A decline in firm creation has sizable employment consequences and can hinder social mobility, especially in developing countries.

References

Aaronson, Daniel, "Price pass-through and the minimum wage," *Review of Economics and statistics*, 2001, *83* (1), 158–169. 34

——— **and Eric French**, "Product Market Evidence on the Employment Effects of the Minimum Wage," *Journal of Labor Economics*, 2007, *25* (1), 167–200. 34

———, ———, **Isaac Sorkin, and Ted To**, "Industry Dynamics and the Minimum Wage: A Putty-Clay Approach," *International Economic Review*, 2018, *59* (1), 51–84. 3

Adao, Rodrigo, Michal Kolesár, and Eduardo Morales, "Shift-share designs: Theory and inference," *The Quarterly Journal of Economics*, 2019, *134* (4), 1949–2010. 4

Autor, David, David Dorn, Lawrence F Katz, Christina Patterson, and John Van Reenen, "The Fall of the Labor Share and the Rise of Superstar Firms," *The Quarterly Journal of Economics*, 2020, *135* (2), 645–709. 44, 46

Blanchard, Olivier and Francesco Giavazzi, "Macroeconomic Effects of Regulation and Deregulation in Goods and Labor Markets," *The Quarterly Journal of Economics*, 2003, *118* (3), 879–907. 3

Borusyak, Kirill, Peter Hull, and Xavier Jaravel, "Quasi-Experimental Shift-Share Research Designs," *arXiv*, 2020, pp. arXiv–1806. 4

Cengiz, Doruk, Arindrajit Dube, Attila Lindner, and Ben Zipperer, "The Effect of Minimum Wages on Low-Wage Jobs," *The Quarterly Journal of Economics*, 2019, *134* (3), 1405–1454. 2, 30

Chen, Yuci, "What Do Establishments Do When Wages Increase? Evidence from Minimum Wages in the United States," Technical Report 2019. 2, 13

Clemens, Jeffrey and Michael Wither, "The Minimum Wage and the Great Recession: Evidence of Effects on the Employment and Income Trajectories of Low-Skilled Workers," *Journal of Public Economics*, 2019, *170*, 53–67. 18

Council of Economic Advisers, "Labor Market Monopsony: Trends, Consequences and Policy Responses," *Issue Brief. October.*, 2016. 46

Coviello, Decio, Erika Deserranno, and Nicola Persico, "Minimum Wage and Individual Worker Productivity: Evidence from a Large US Retailer," *Workforce Science Project of*

the Searle Center for Law, Regulation, and Economic Growth, Northwestern University, 2018. 34

Crane, Leland, Henry Hyatt, and Seth Murray, "Cyclical Labor Market Sorting," *Unpublished draft, U.S. Census Bureau.*, 2019. 13, 59

Decker, Ryan, John Haltiwanger, Ron Jarmin, and Javier Miranda, "The Role of Entrepreneurship in US Job Creation and Economic Dynamism," *Journal of Economic Perspectives*, 2014, *28* (3), 3–24. 3, 50

Draca, Mirko, Stephen Machin, and John Van Reenen, "Minimum Wages and Firm Profitability," *American Economic Journal: Applied Economics*, 2011, *3* (1), 129–51. 17

Dube, Arindrajit, "Impacts of Minimum Wages: Review of the International Evidence," *HM Treasury and Department for Business, Energy & Industrial Strategy*, 2019. 5, 25, 30

___ , "Minimum wages and the distribution of family incomes," *American Economic Journal: Applied Economics*, 2019, *11* (4), 268–304. 31

Elsby, Michael WL, Bart Hobijn, and Ayşegül Şahin, "The Decline of the US Labor Share," *Brookings Papers on Economic Activity*, 2013, *2013* (2), 1–63. 46

Engbom, Niklas and Christian Moser, "Earnings Inequality and the Minimum Wage: Evidence From Brazil," *Federal Reserve Bank of Minneapolis-Opportunity and Inclusive Growth Institute Working Paper*, 2018, *7*, 18–50. 59

Flinn, Christopher J, "Minimum Wage Effects on Labor Market Outcomes Under Search, Matching, and Endogenous Contact Rates," *Econometrica*, 2006, *74* (4), 1013–1062. 3

Gindling, Thomas H, Nadwa Mossaad, and Juan Diego Trejos, "The consequences of increased enforcement of legal minimum wages in a developing country: An evaluation of the impact of the Campaña Nacional de Salarios Mínimos in Costa Rica," *ILR Review*, 2015, *68* (3), 666–707. 41

Giupponi, Giulia and Stephen J Machin, "Changing the Structure of Minimum Wages: Firm Adjustment and Wage Spillovers," 2018. 3

Goldsmith-Pinkham, Paul, Isaac Sorkin, and Henry Swift, "Bartik instruments: What, when, why, and how," *American Economic Review*, 2020, *110* (8), 2586–2624. 4, 18, 20, 21

Haltiwanger, John, Ron S Jarmin, and Javier Miranda, "Who Creates Jobs? Small versus Large versus Young," *Review of Economics and Statistics*, 2013, *95* (2), 347–361. 3, 50

Harasztosi, Péter and Attila Lindner, "Who Pays for the Minimum Wage?," *American Economic Review*, 2019, *109* (8), 2693–2727. 3, 34

Hau, Harald, Yi Huang, and Gewei Wang, "Firm Response to Competitive Shocks: Evidence From China's Minimum Wage Policy," *The Review of Economic Studies*, 2020, *135*, 20–42. 13, 34

Jardim, Ekaterina and Emma Van Inwegen, "Payroll, Revenue, and Labor Demand Effects of the Minimum Wage," Technical Report, Upjohn Institute Working Paper 2019. 3

Jordà, Òscar, "Estimation and Inference of Impulse Responses by Local Projections," *American Economic Review*, 2005, *95* (1), 161–182. 4, 23

Karabarbounis, Loukas and Brent Neiman, "The Global Decline of the Labor Share," *The Quarterly Journal of Economics*, 2014, *129* (1), 61–103. 3, 46

Karahan, Fatih, Benjamin Pugsley, and Ayşegül Şahin, "Demographic Origins of the Startup Deficit," Technical Report, National Bureau of Economic Research 2019. 3, 48

Kehrig, Matthias and Nicolas Vincent, "The Micro-Level Anatomy of the Labor Share Decline," *The Quarterly Journal of Economics*, Forthcoming. 44, 46

Lachowska, Marta, Alexandre Mas, Raffaele D Saggio, and Stephen A Woodbury, "Do Firm Effects Drift? Evidence from Washington Administrative Data," Technical Report, National Bureau of Economic Research 2020. 13, 59

Mayneris, Florian, Sandra Poncet, and Tao Zhang, "Improving or Disappearing: Firm-level Adjustments to Minimum Wages in China," *Journal of Development Economics*, 2018, *135*, 20–42. 13, 17

Meer, Jonathan and Jeremy West, "Effects of the Minimum Wage on Employment Dynamics," *Journal of Human Resources*, 2016, *51* (2), 500–522. 18

Melitz, Marc J and Sašo Polanec, "Dynamic Olley-Pakes Productivity Decomposition With Entry and Exit," *The Rand Journal of Economics*, 2015, *46* (2), 362–375. 5, 44

Neumark, David, "The Econometrics and Economics of the Employment Effects of Minimum Wages: Getting from Known Unknowns to Known Knowns," *German Economic Review*, 2019. 18, 30

OECD, "OECD Reviews of Labour Market and Social Policies: Costa Rica," *OECD Publishing, Paris*, 2017. 7, 39

——, "OECD Economic Survey of Costa Rica: Research Findings on Productivity," *OECD Publishing, Paris*, 2018. 39

Piketty, Thomas, "About Capital in the Twenty-First Century," *American Economic Review*, 2015, *105* (5), 48–53. 3, 46

Pugsley, Benjamin Wild and Ayşegül Şahin, "Grown-up Business Cycles," *The Review of Financial Studies*, 2019, *32* (3), 1102–1147. 3, 5, 48, 50

Song, Jae, David J Price, Fatih Guvenen, Nicholas Bloom, and Till Von Wachter, "Firming up inequality," *The Quarterly Journal of Economics*, 2019, *134* (1), 1–50. 13, 59

Sorkin, Isaac, "Are There Long-Run Effects of the Minimum Wage?," *Review of economic dynamics*, 2015, *18* (2), 306–333. 2, 18, 24

——, "Ranking Firms Using Revealed Preference," *The Quarterly Journal of Economics*, 2018, *133* (3), 1331–1393. 13, 59, 60

Stigler, George J, "The Economics of Minimum Wage Legislation," *The American Economic Review*, 1946, *36* (3), 358–365. 2

Trejos, Juan Diego, "¿Es la distribución del ingreso neutra a la política de fijación de salarios mínimos?," *Programa Estado de la Nación*, 2016. 8

Appendix

A Information Sources and Data Construction

This appendix offers details on the datasets used in this article. To access Costa Rica's administrative data, it is necessary to follow a security protocol to protect the confidentiality of the information.

A.1 Monthly Employer-Employee Dataset (CR-LEED)

The first source of information is a monthly linked employer-employee data (CR-LEED) that I construct using raw firm-level monthly records reported to the Costa Rican Social Security Fund and secured by the Central Bank of Costa Rica (BCCR). Each month, employers are required to report accurate information on individual monthly earnings for tax collection and pension contribution purposes. Misreporting is heavily fined, and workers have strong incentives to make sure their information is correct, as otherwise it would negatively impact their future pension and access to social security benefits. The reports' purpose implies that the dataset omits part of the informal sector as it only covers individuals that contribute to social security. The information begins in January 2006 and ends in December 2017.

I exclude from analysis retired workers, self-employed workers and individuals that are voluntarily insured (people that contribute to the system to obtain the various social benefits).[23] I exclude workers that consistently report a monthly wage of less than 90% the minimum wage minimorum —the lowest legal wage floor.[24] I exclude matches that last less than three consecutive quarters and firms that survive less than three consecutive quarters (around 2% of remaining observations).

The data encompasses individual variables such as the personal legal identifier (*cédula de identidad*), gender, age and nationality. Regarding the characteristics of the job match, the dataset covers the monthly earnings, occupation codes (5 digit codes consistent with the International Standard Classification of Occupations -ISCO[25]), sick-leave

[23]The law establishes a "minimum tax base", a monthly wage that every employer and worker must contribute to access the health and pension system. Such value fluctuated between 50 and 60 percent of the lowest minimum wage.

[24]I exclude them from constructing the minimum wage exposure measures, but I keep them as part of the number of workers employed by the firm when estimating the disemployment and capital/labor substitution effects.

[25]ISCO organizes jobs into a clearly defined set of groups according to the tasks and duties undertaken in the job.

indicator and the geographic location of both the worker and the employer. Likewise, it includes the legal tax identifier of the employer, economic activity and firm type (private company, state-owned, household).

A.2 Corporate Income Tax Returns (REVEC)

The second administrative dataset consists of the universe of corporate income tax declarations from 2005 to 2018. Costa Rica's legislation requires all corporations and individuals with an economic activity to file the D-101 tax declaration (*Declaración Jurada del Impuesto Sobre la Renta*) to the Ministry of Finances. The report combines information on revenues, expenditures (administrative costs, cost of goods sold, capital depreciation, interest payments and others), assets (net and fixed) and profits. Firms are classified with the same legal identifier as the one used for employers in the CR-LEED dataset. The Ministry of Finances imposes significant fines for not filing the tax declarations and several financial institutions and business promoting agencies oblige firms to fulfill their tax obligations to access credit, subsidies and other benefits. Additionally, firms are classified using a 4-digit ISIC Rev. 4 classification code. Moreover, the BCCR internally combines the REVEC with other data sources to include exports, imports, an indicator of whether the firm operates under a Free Trade Zone agreement, among others. This dataset is heavily used by the Central Bank of Costa Rica to produce macroeconomic indicators and guide monetary policy, so different internal divisions correct inconsistencies and check for the robustness of the information.

The BCCR classifies firms into two groups: a corporate group (share ownership) and a firm group (share ownership and behaves as a single firm). Since this structure could introduce some noise into the job flows and the relationship between the minimum wage policy and firm characteristics, I collapse firm groups into a single observation, adding up pertinent measures while keeping fixed characteristics such as sector, location or industry from the firm within the group with the highest sales.

A.3 Minimum Wage Exposure Measure

I followed Sorkin (2018); Crane et al. (2019); Song et al. (2019), Engbom and Moser (2018), Lachowska et al. (2020) and literature within to construct the relevant datasets exploited for the different estimations. I also benefited from guidance by the Economic Research Department and the Economic Analysis Department of the Central Bank of Costa Rica (BCCR) to have a better understanding of the information reported by firms in their raw reports.

I exploit the monthly employer-employee dataset to construct the minimum wage exposure measures. The main challenge is to overcome the lack of hours worked information, which is a limitation that is usually observed in other employer-employee datasets.

Almost all employers consistently report either if the worker is working part-time or is under a paid-leave. I restrict the analysis to workers consistently employed full-time to construct the firm-level exposure measures. Some workers report multiple jobs within a month, so I consider the one with the highest wage. If wages are the same across the employers, then I keep the observation that (i) maximizes the employment spell, (ii) the employer information is also included in the REVEC dataset or (iii) quality of information is higher. Since this paper heavily relies on worker flows and productivity measures, I implement a two-step procedure to clean the unique employer identifiers. Otherwise, I can end up with an overstatement of flows that could bias the results. First, the BCCR identifies groups of firms with common owners and that behave as a single unit. I use this information and treat firms in these groups as a single one by assigning the ID of the firm with the highest sales reported during the entire period of study. The second step follows Sorkin (2018) and comes from the fact that firm identifiers can change because of administrative errors, changes in ownership, and others that were not accurately identified in the first stage. Sizeable groups of workers moving from employer A to employer B in consecutive periods likely reflect errors in the administrative data rather than a genuine set of flows. Hence, I correct employer identifiers by assuming that if 70% or more of employer A's workers moved to employer B, then either employer B is a relabeling of employer A or employer B acquired employer A.

Next, I define an annual dominant employer: the employer for which the worker had the highest total earnings in the calendar year. Afterward, I track the earnings stability across quarters to mark atypical observations (values 5% outside the quarter or the annual average within the employment match). Basically, this involves bonifications[26], overtime payment, sick leaves, and months covering extra pay periods[27]. If the standard deviation of the remaining observations within the quarter is less than 5% the average wage of these remaining observations, then I substitute the atypical value with the average of the remaining months within the quarter, otherwise I exclude these observations from the next steps. Next, I construct quarterly earnings. I code each month into two mutually

[26]Public and a limited fraction of private-sector workers have the *scholar wage*, an extra monthly wage being paid in January to help families to cover school entrance expenses. Additionally, all employers must pay a 13th monthly wage, called the *aguinaldo,* each December to all workers and such a payment is exempted from any payroll and social insurance tax. Consequently, some firms include such extra payment even though it is not mandatory.

[27]For example, when the worker is paid every two weeks, some months will include three payments instead of two.

exclusive categories: full-month (earnings from the employer are in months $t-1$, t and $t+1$) or continuous (if earnings are in months $t-1$ and t or t and $t+1$). I take the average of full-month wages for each quarter. If the worker does not have full-month wages, then the average of continuous wages. I avoid using "discontinuous" months, neither full nor continuous, to construct the quarterly wage. Most of these observations are very transitory job matches that introduce unnecessary noise to the data, and they represent less than 2% of the remaining data.

I use the quarterly dataset to estimate minimum wage exposure. I take the quarter wage of each worker in the first quarter of the calendar year, and I estimate the gap between the reported salary and the corresponding minimum wage for the next year.

A.3.1 Classifying occupations according to relevant minimum wage

I use official minimum wage decrees to map the occupation to the corresponding minimum wage. These decrees are highly segregated, consisting of specific information for over 200 occupations (see Appendix B.3 illustrating the information distributed by the Ministry of Labor and Social Security (MTSS) and seen by employers). However, these documents do not have occupational codes consistent with the data, just job titles. To minimize errors, I complement the decrees with a handbook of occupational profiles supplied by the Social Security Fund Administration (CCSS, 2014) that suggests how to connect minimum wages and occupational codes. I also acknowledge the support of the Compliance Assistance Program of the MTSS, an internal division helping workers and firms on how to fulfill the minimum wage requirements, to associate occupations and the respective legal wage floor.

B Supplementary Figures and Tables

Figure B.1: Wage Distribution by Occupational Groups

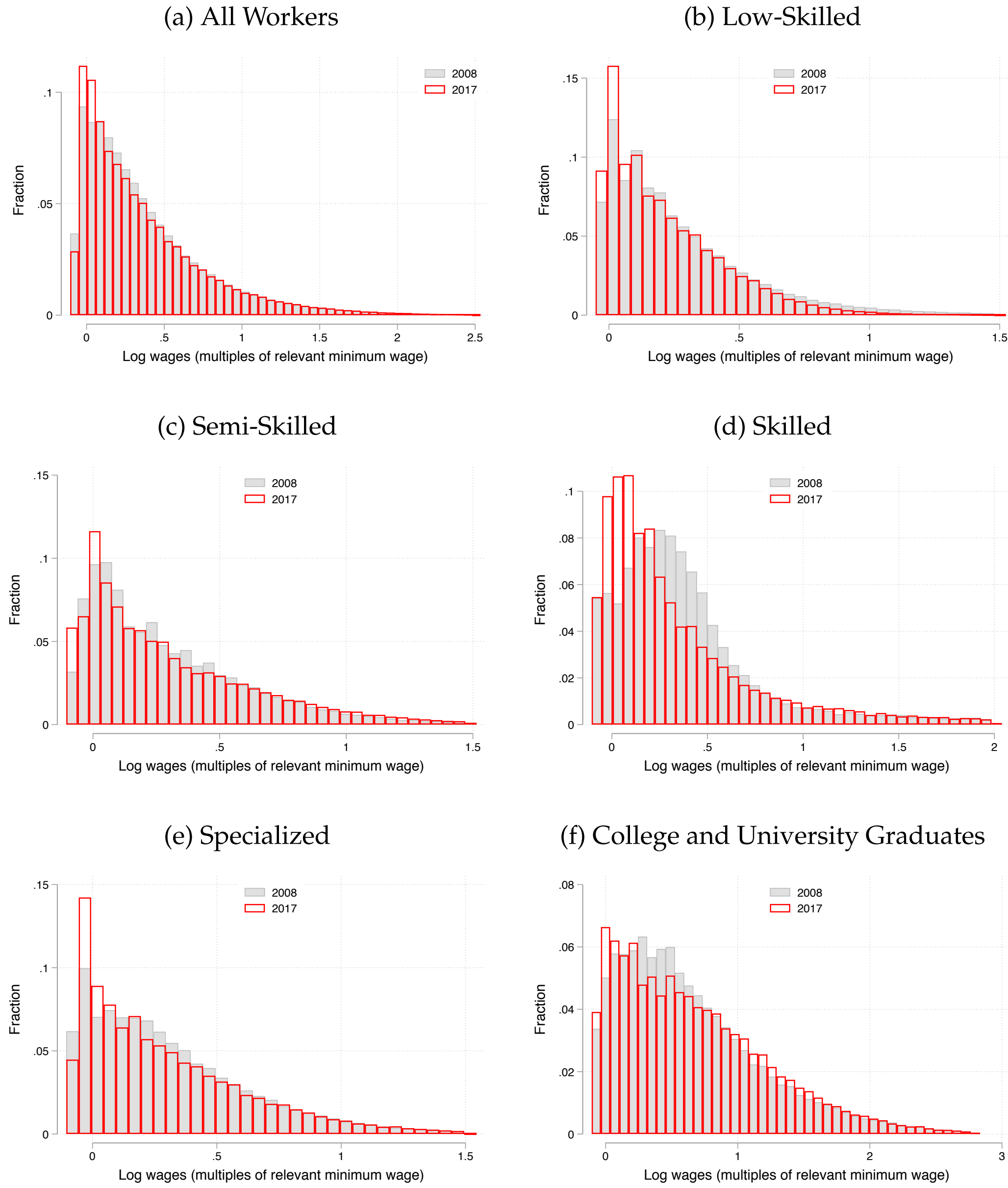
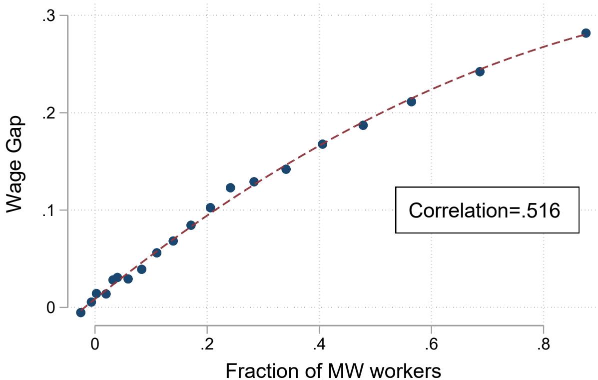


Figure B.2: Employment-based and Wage-based Exposure Measures



Notes: Figure shows the correlation between the employment-based (fraction of minimum wage workers) and the benchmark minimum wage exposure measure (wage gap)

Figure B.3: Minimum Wage Decree, 2017

Panadero	TC	¢ 10.877,41
Parrillero	TSC	¢ 10.680,80
Pastelero	TC	¢ 10.877,41
Pedimentador Aduana, Vapores	TE	¢ 12.829,63
Peinadora	TC	¢ 10.877,41
Peón Agrícola Labores Livianas	TNC	¢ 9.822,07
Peón Agríc Labores Pesadas (6 hrs.)	TNC	¢ 9.822,07
Peón de Bodegas Frías	TC	¢ 10.877,41
Peón de Camión Distribuidor	TNC	¢ 9.822,07
Peón de Carga y Descarga	TNC	¢ 9.822,07
Peón de Construcción	TNC	¢ 9.822,07
Peón de Jardín	TNC	¢ 9.822,07
Peón en General	TNC	¢ 9.822,07
Periodista *		¢ 775.161,64
Pilero (Lavador de Platos)	TNC	¢ 9.822,07
Pintor Automotriz	TE	¢ 12.829,63
Pintor de Brocha Gorda	TC	¢ 10.877,41
Pistero	TSC	¢ 10.680,80
Pizzero (Cocina Pizzas Preparadas)	TSC	¢ 10.680,80
Portero *	TNCG	¢ 293.132,67
Prensista de Artes Gráficas	TE	¢ 12.829,63
Preparador documentos, Ag. Aduana	TE	¢ 12.829,63
Programador de Computación	TE	¢ 12.829,63
Programador en Radioemisoras	TE	¢ 12.829,63
Proveedor *	TCG	¢ 331.516,22
Quemador de Marcos (Serigrafía)	TC	¢ 10.877,41
Quemador de Planchas	TE	¢ 12.829,63
Recamarera	TNC	¢ 9.822,07
Recepcionista *	TSCG	¢ 315.364,86
Recibidor de docu, Ag. Aduana	TE	¢ 12.829,63
Recolectores de Café Cajuela		¢ 935,19
Recolectores de Coyol	Kilo	¢ 30,75
Relojero	TC	¢ 10.877,41
Repartidor de Cargas Livianas	TNC	¢ 9.822,07
Repartidor-Propagandista	TNC	¢ 9.822,07
Repostero	TC	¢ 10.877,41
Sabanero	TNC	¢ 9.822,07
Salonero	TNC	¢ 9.822,07
Sastre (Prendas a la Medida)	TE	¢ 12.829,63
Secretaria *	TCG	¢ 331.516,22
Secretaria*	TMED	¢ 347.405,37
Secretaria*	DES	¢ 462.406,00
Secretaria*	Bach	¢ 524.477,85
Secretaria*	Lic	¢ 629.395,00
Sellista (Artes Gráficas)	TC	¢ 10.877,41
Servicio Doméstico *		¢ 178.703,50
Soldador (Soldaduras Especiales)	TE	¢ 12.829,63
Soldador en General	TC	¢ 10.877,41
Tapicero	TC	¢ 10.877,41
Taxista 30% Entradas Brutas (ó si se Interrumpe el Servicio)		¢ 11.615,26
Talleres Dentales (Operarios)	TC	¢ 10.877,41
Técnico de Educación Superior *	TEdS	¢ 428.138,90
Técnico en Aire Acondicionado	TC	¢ 10.877,41
Técnico en Aparatos Ortopédicos	TES	¢ 19.910,28
Técnico en Lentes de Contacto	TES	¢ 19.910,28
Téc. Refrigeración Doméstica-Indus.	TES	¢ 19.910,28
Técnico en Registros Médicos *	TCG	¢ 331.516,22
Técnico Máq. Coser Ind. Especiales	TES	¢ 19.910,28
Técnico Medio Educ. Diversificada *	TMED	¢ 347.405,37
Técnico Reparación Audio y Video	TES	¢ 19.910,28
Técnicos en Salud *	TEdS	¢ 428.138,90
Tejedora Manual de Prendas, Muebles	TC	¢ 10.877,41
Telefonista *	TSCG	¢ 315.364,86
Tornero en Madera	TC	¢ 10.877,41
Tornero en Metal	TE	¢ 12.829,63
Tractorista (Oruga o Llanta)	TC	¢ 10.877,41
Tramitador - Abridor Aduanal	TSC	¢ 10.680,80
Vagonetero	TC	¢ 10.877,41
Verdulero	TSC	¢ 10.680,80
Zapatero	TC	¢ 10.877,41

Estos salarios contienen un incremento del **1.14 %** para todas las categorías del Decreto en relación con los salarios mínimos del periodo anterior, excepto para servicio doméstico ya que se le otorgo un **1.50%.**

Para efectos de los Salarios Mínimos el instrumento para la clasificación de ocupaciones son los Perfiles Ocupacionales aprobados por el Consejo Nacional de Salarios. De conformidad con ellos se ha elaborado esta guía ilustrativa que contiene algunas ocupaciones clasificadas por Personal Técnico del Departamento de Salarios, en el entendido de que se basan en las tareas típicas conocidas, por lo que un puesto determinado podría tener una clasificación distinta según sus características y responsabilidades específicas.

Esta lista está disponible en: www.mtss.go.cr
Para consultas laborales llama gratuitamente:

800 TRABAJO
800 872 22 56

Documento gratuito, prohibida su reproducción y venta

MTSS
MINISTERIO DE TRABAJO Y SEGURIDAD SOCIAL

DEPARTAMENTO DE SALARIOS

Lista de ocupaciones clasificada por el personal técnico del Departamento

SALARIOS MÍNIMOS
SECTOR PRIVADO
PRIMER Y SEGUNDO SEMESTRE 2017

Decreto Nº40022-MTSS, publicado en La Gaceta 230, Alcance N°278 del 30 de NOVIEMBRE del 2016. Rige 1º de enero del 2017.

SIGLAS Y SALARIOS MÍNIMOS:

TNC:	Trabajador no Calificado	¢ 9.822,07
TSC:	Trabajador Semicalificado	¢ 10.680,80
TC:	Trabajador Calificado	¢ 10.877,41
TE:	Trabajador Especializado	¢ 12.829,63
TNCG:	Trabajador no Calificado Genéricos	¢293.132,67*
TSCG:	Trabajador Semicalificado Genéricos	¢315.364,86*
TCG:	Trabajador Calificado Genéricos	¢331.516,22*
TMED	Técnico Medio Educación Diver.	¢347.405,37*
TEG:	Trabajador Especializado Genéricos	¢372.288,99*
TEdS:	Técnico de Educación Superior	¢428.138,90*
DES:	Diplomados de Educación Superior	¢462.406,00*
Bach:	Bachiller Universitario	¢524.477,85*
Lic.:	Licenciado Universitario	¢629.395,00*
TES:	Trabajador Especialización Superior	¢ 19.910,28

*** Salario mensual.**
El que no tiene ninguna indicación, está por jornada ordinaria.

CONSULTAS DE SALARIOS AL CORREO:
consulta.salarios@mtss.go.cr
salario.minimo@mtss.go.cr

Para mayor información y debido a que se han hecho circular algunas listas alteradas, se sugiere consultar personalmente en la Oficina de Salarios, en Barrio Tournon del Edif. Benjamín Núñez 50 metros sureste sobre calle paralela, Edificio Anexo, al Ministerio de Trabajo y Seguridad Social, Segundo Piso.

Teléfono: 2256 2221 Fax: 2257 4633.

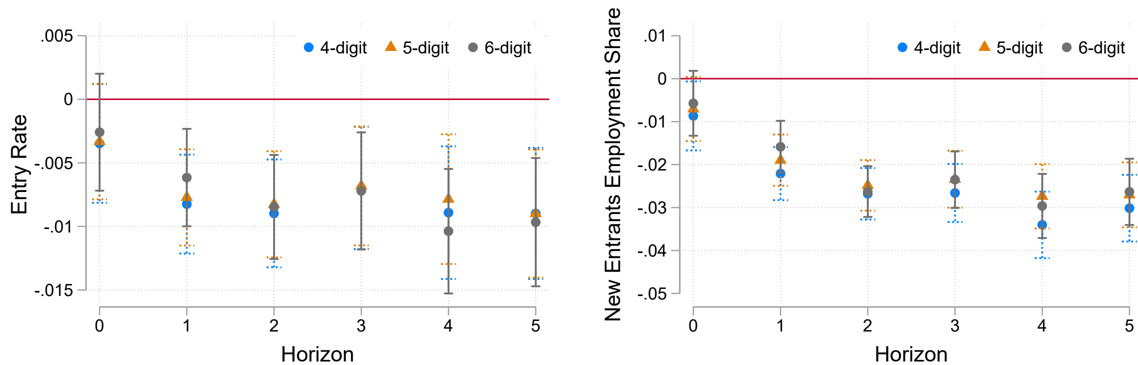
Acomodador (cines, teatros, etc.)	TNC	¢ 9.822,07
Agente de Aduana o Vapores	TES	¢ 19.910,28
Agente de Ventas *	TCG	¢ 331.516,22
Albañil	TC	¢ 10.877,41
Alistador Automotriz (lijador)	TSC	¢ 10.680,80
Aplanchador (plancha tipo casera)	TNC	¢ 9.822,07
Aplanchador con Equipo de Vapor	TC	¢ 10.877,41
Analista de Crédito*	TCG	¢ 331.516,22
Asistente de Abogacía *	TEG	¢ 372.288,99
Asistente de Auditoría *	DES	¢ 462.406,00
Asistente de Consultorio Médico	TC	¢ 10.877,41
Asist. Domicilio/Ancianos (cuidados especiales)	TE	¢ 12.829,63
Auxiliar Agente de Aduana, Vapores	TE	¢ 12.829,63
Auxiliar de Contabilidad*	TCG	¢ 331.516,22
Auxiliar Dental	TE	¢ 12.829,63
Ayudante de Cocina	TSC	¢ 10.680,80
Ayudante de Mecánico general	TSC	¢ 10.680,80
Ayudante de Operario, Construcción	TSC	¢ 10.680,80
Bachiller Universitario *	Bach	¢ 524.477,85
Baqueano	TSC	¢ 10.680,80
Bartender (Coctelero)	TC	¢ 10.877,41
Bodeguero (Encargado) *	TSCG	¢ 315.364,86
Bodeguero (Peón) *	TNCG	¢ 293.132,67
Boletero	TSC	¢ 10.680,80
Cajero *	TCG	¢ 331.516,22
Cajista de Artes Gráficas	TE	¢ 12.829,63
Calderetero (Operador de Caldera)	TC	¢ 10.877,41
Calderetista (Mantenimiento)	TE	¢ 12.829,63
Camarógrafo de Prensa	TES	¢ 19.910,28
Cantante de Música Popular	TC	¢ 10.877,41
Cantinero	TSC	¢ 10.680,80
Capitán de Embarcación	TE	¢ 12.829,63
Carnicero Empleado Despacho	TSC	¢ 10.680,80
Carnicero Destazador	TC	¢ 10.877,41
Carpintero	TC	¢ 10.877,41
Cerrajero	TC	¢ 10.877,41
Chapulinero	TC	¢ 10.877,41
Chequeador Agenc Aduana, Vapores	TE	¢ 12.829,63
Chequeador de Buses	TNC	¢ 9.822,07
Chofer de Bus (no cobrador)	TC	¢ 10.877,41
Chofer de Tráiler	TE	¢ 12.829,63
Chofer de Vehículo Liviano	TSC	¢ 10.680,80
Chofer de Vehículo Pesado	TC	¢ 10.877,41
Chofer Microbús (menos de11pasaj.)	TSC	¢ 10.680,80
Chofer-Cobrador de Bus	TE	¢ 12.829,63
Cobrador de Buses	TNC	¢ 9.822,07
Cobrador *	TSCG	¢ 315.364,86
Cocinero	TC	¢ 10.877,41
Confección Muestras de Ropa	TE	¢ 12.829,63
Conserje *	TNCG	¢ 293.132,67
Contador Privado *	TMED	¢ 347.405,37
Contador Privado *	DES	¢ 462.406,00
Contador Privado *	Bach.	¢ 524.477,85
Contador Privado *	Lic.	¢ 629.395,00
Cortador de tela	TC	¢ 10.877,41
Cosedor Piezas /Prendas a Máquina	TC	¢ 10.877,41
Costurera (Modista)	TE	¢ 12.829,63
Counter (Vendedor de Pasajes) *	TCG	¢ 331.516,22
Dealer (Distribuidor de cartas)	TNC	¢ 9.822,07
Demostrador (Display)	TNC	¢ 9.822,07
Demostrador-Vendedor	TSC	¢ 10.680,80
Dependiente	TSC	¢ 10.680,80
Dependiente Café Internet	TSC	¢ 10.680,80
Despachador Agencia Aduana, Vapores	TE	¢ 12.829,63
Diagramador en Artes Gráficas	TE	¢ 12.829,63
Dibujante en Artes Gráficas	TE	¢ 12.829,63
Dibujante de Ingeniería, Arquitectura *	TCG	¢ 331.516,22
Digitador	TC	¢ 10.877,41
Diplomado Parauniversitario *	DES	¢ 462.406,00
Diplomado Universitario*	DES	¢ 462.406,00
Ebanista	TE	¢ 12.829,63
Educador Aspirante sin Título *	TEG	¢ 372.288,99
Electricista	TC	¢ 10.877,41
Electromecánico	TE	¢ 12.829,63
Empacador; Etiquetador	TNC	¢ 9.822,07
Empleado de Despacho	TSC	¢ 10.680,80
Empleada Doméstica*		¢ 178.703,50
Encargado (indica acomodo parqueo)	TNC	¢ 9.822,07
Encargado de Limpieza en General	TNCG	¢ 293.132,67
Encargado de Limpieza en Piscinas	TNC	¢ 9.822,07
Enc. Mantenim. Correctivo Cómputo	TE	¢ 12.829,63
Enc. Mantenim. Preventivo Cómputo	TC	¢ 10.877,41
Encargado de poner Discos (Disjokey)	TNC	¢ 9.822,07
Encargado de Cámaras Frigoríficas	TSC	¢ 10.680,80
Encargado Mantenimiento Edificios	TC	¢ 10.877,41
Encerador de Carros	TNC	¢ 9.822,07
Encuadernador - Empastador	TC	¢ 10.877,41
Encuadernador en Fino	TE	¢ 12.829,63
Encuadernador en Rústica	TSC	¢ 10.680,80
Encuestador *	TSCG	¢ 315.364,86
Enderezador Automotriz	TC	¢ 10.877,41
Engrasador de Autos	TSC	¢ 10.680,80
Ensamblador de Computadoras	TSC	¢ 10.680,80
Envasador Manual	TNC	¢ 9.822,07
Esparcidor de Plaguicidas (6hrs)	TNC	¢ 9.822,07
Estampador en Textil (Serigrafía)	TC	¢ 10.877,41
Esteticista	TE	¢ 12.829,63
Estibador por Kilo de frutas y vegetales		¢ 0,0675
Estibador por Movimiento		¢ 355,84
Estibador por Tonelada		¢ 83,44
Estilista	TC	¢ 10.877,41
Florista	TC	¢ 10.877,41
Fontanero	TC	¢ 10.877,41
Fotocopiador (Centro fotocopiado)	TSC	¢ 10.680,80
Fotógrafo de Prensa	TE	¢ 12.829,63
Fotomecánico de Artes Gráficas	TE	¢ 12.829,63
Fotomontador (Artes Gráficas)	TE	¢ 12.829,63
Fresador (Metalmecánica)	TE	¢ 12.829,63
Fumigador (Doméstica)	TSC	¢ 10.680,80
Fundidor	TC	¢ 10.877,41
Futbolista Primera División	TE	¢ 12.829,63
Futbolista Segunda División	TC	¢ 10.877,41
Gondolero	TNC	¢ 9.822,07
Graduado del INA *	TMED	¢ 347.405,37
Guarda *	TSCG	¢ 315.364,86
Guarda Custodio Valores-Portavalores	TCG	¢ 331.516,22
Guía Turístico	TC	¢ 10.877,41
Guillotinista (Guillotina Eléctrica)	TC	¢ 10.877,41
Guillotinista (Electrónica programable)	TE	¢ 12.829,63
Hojalatero	TC	¢ 10.877,41
Horneador (Horno Electrónico program)	TSC	¢ 10.680,80
Hornero	TC	¢ 10.877,41
Inspector de Cámaras	TE	¢ 12.829,63
Instructor de Bailes Populares	TC	¢ 10.877,41
Jardinero (Crear Jardines)	TC	¢ 10.877,41
Jefe de Cocina (Chef)	TE	¢ 12.829,63
Jefe de Saloneros (Maitre)	TE	¢ 12.829,63
Joyero	TC	¢ 10.877,41
Laboratorista Civil	TC	¢ 10.877,41
Laboratorista Clínico	TC	¢ 10.877,41
Laqueador (Muebles y Similares)	TC	¢ 10.877,41
Lavador de Cabello	TNC	¢ 9.822,07
Lavador de Carros	TNC	¢ 9.822,07
Levantador de Texto (Artes Gráficas)	TE	¢ 12.829,63
Licenciado Universitario *	Lic.	¢ 629.395,00
Limpiador de Tanques Sépticos	TC	¢ 10.877,41
Linotipista (Artes Gráficas)	TC	¢ 10.877,41
Liquidador Agencia Aduana, Vapores	TE	¢ 12.829,63
Llantero	TSC	¢ 10.680,80
Locutor de Radioemisora	TE	¢ 12.829,63
Locutor de Televisión	TES	¢ 19.910,28
Luminotécnico TV	TES	¢ 19.910,28
Maestro de Obras (Construcción)	TE	¢ 12.829,63
Manicurista; Maquilladora	TC	¢ 10.877,41
Maquinista de Embarcaciones	TC	¢ 10.877,41
Marinero	TNC	¢ 9.822,07
Masajista	TC	¢ 10.877,41
Mecánico General	TC	¢ 10.877,41
Mecánico Precisión	TE	¢ 12.829,63
Mecánico Máquinas de Coser Industrial	TE	¢ 12.829,63
Mecánico de Máquinas de hacer Telas	TE	¢ 12.829,63
Mensajero *	TNCG	¢ 293.132,67
Misceláneo *	TNCG	¢ 293.132,67
Misceláneo en Hogares Tercera Edad	TNC	¢ 9.822,07
Montacarguista	TSC	¢ 10.680,80
Mucama	TNC	¢ 9.822,07
Musicalizador en Radioemisoras	TE	¢ 12.829,63
Niñera, excepto en el Hogar del Niño	TNC	¢ 9.822,07
Niñera en el Hogar del Niño (Servicio Doméstico)		¢ 178.703,50
Oficial de Mesa (panadería)	TC	¢ 10.877,41
Oficinista (General) *	TSCG	¢ 315.364,86
Operador de Cabina de Radioemisora	TE	¢ 12.829,63
Operador de "Araña" (Serigrafía)	TC	¢ 10.877,41
Operador de Carrusel	TC	¢ 10.877,41
Operador de Computación	TE	¢ 12.829,63
Operador de Draga	TE	¢ 12.829,63
Operador de Grúa Estacionaria	TE	¢ 12.829,63
Operador de Máquina de Lavar Ropa	TC	¢ 10.877,41
Operador de Maquinaria Pesada	TC	¢ 10.877,41
Operador de Máquinas en General	TC	¢ 10.877,41
Operador de Planta Transm. Radio	TC	¢ 10.877,41
Operador de Prensa Rotativa	TES	¢ 19.910,28
Operador de Radio-Taxi	TC	¢ 10.877,41
Operador de Escogedoras de Café	TC	¢ 10.877,41
Operador Escaner separador colores	TES	¢ 19.910,28
Operario en Construcción	TC	¢ 10.877,41
Ordeñador a Mano	TNC	¢ 9.822,07

Table B.1: Nominal Minimum Wage by Economic Sector

	Agriculture	Manufacturing	Construction	Trade	Transportation, Storage & Information	Services	Generic
2006	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2007	111.3	111.2	111.2	111.2	111.2	111.2	111.2
2008	122.9	122.9	122.9	122.9	122.9	123.3	122.9
2009	141.7	141.7	142.1	142.1	141.5	143.0	140.8
2010	151.8	151.8	152.2	152.2	151.5	153.2	150.8
2011	162.1	162.2	162.7	162.7	161.8	163.7	161.0
2012	172.0	172.9	173.7	173.7	172.3	174.2	170.9
2013	183.6	184.5	185.5	185.5	183.9	186.0	182.4
2014	195.2	196.1	197.1	197.1	195.5	197.7	193.8
2015	207.5	206.9	208.5	208.5	205.8	209.0	203.4
2016	210.8	210.2	211.8	211.8	209.1	212.5	206.7
2017	214.3	213.7	215.3	215.3	212.6	216.6	210.1
Real % Change (2006-2017)	22.8	22.5	23.4	23.4	21.8	24.1	20.4

Notes: January 2006=100. Table shows the average minimum wage by main economic sector, using the minimum wage by occupation and weighting by the corresponding employment share in each industry.

Figure B.4: Minimum Wage Exposure and Firm Entry



Notes: Figures show the estimated impulse response functions to minimum wage exposure, alongside 95% confidence intervals. Regressions include industry-level controls and 2-digit industry and year dummies.