Effect of the minimum wage on employment in Mexico (2018-2024)

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Date received: April 21, 2025. Date of acceptance: August 19, 2025.

Abstract

This study evaluates the effects of the cumulative increase in the minimum wage since 2018 on employment in Mexico, treating the country as a single unit. To this end, two methodologies were employed. First, the synthetic control method was used to compare Mexico with similar Latin American countries that did not experience a sustained increase in the minimum wage. Second, we used aggregate information from cities that self-represent in the National Occupation and Employment Survey (NOES) in Mexico, taking advantage of the heterogeneity in how the minimum wage affects each city. The results suggest that there have been no negative effects on employment.

Keywords: minimum wage; employment; labor market; synthetic control; informality.

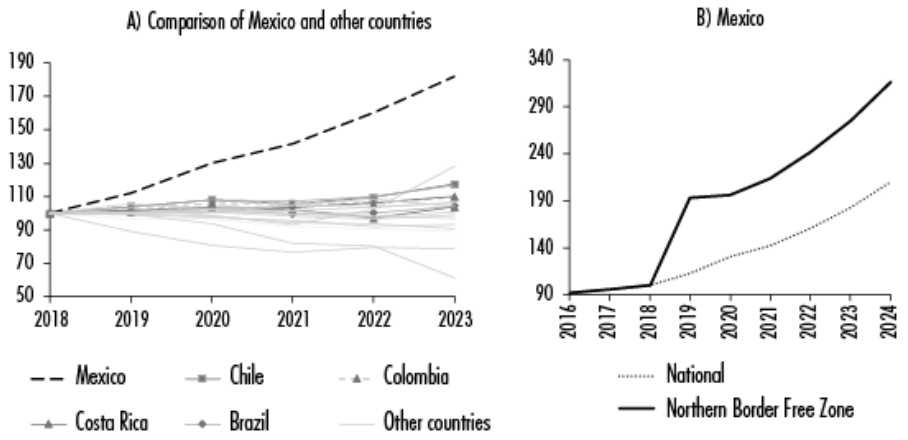
1. INTRODUCTION[1]

In recent years, there has been a substantial change in wage policy in Mexico. Since 2019, the minimum wage has increased significantly, rising by 16% in the country and doubling in the Northern Border Free Zone (Zona Libre de Comercio de la Frontera Norte, or ZLFN). Since then, the minimum wage has increased consistently each year. This has made it possible to study the effect of the minimum wage on the ZLFN in relation to the rest of the country.[2] However, little is known about this last point because it is generally chosen as a comparison group rather than a study group.

This article discusses the potential effect that the minimum wage has had on employment across the country since 2019, when significant increases in the minimum wage came into effect.

Figure 1 shows the evolution of the minimum wage in Mexico and other countries. The graphs create a minimum wage index with a base of 100 in 2018. Panel A compares the evolution of the minimum wage in Mexico and a selected sample of countries, including Brazil, Chile, Colombia and Costa Rica. Figure 1 clearly shows the significant increase in Mexico's minimum wage, which is notably higher than that of any other Latin American country. It also shows that, between 2018 and 2023, Mexico experienced an 82% cumulative increase, compared to 17.5% in Chile, 9.8% in Colombia and 3.5% in Costa Rica. Panel B shows the trajectory of the minimum wage for the ZLFN and the rest of the country between 2018 and 2024. The graph shows that the minimum wage increased by 216% in real terms in the ZLFN and by 110% in the rest of the country. This increase, particularly in the ZLFN, is one of the largest observed since 1960 compared to other countries (Campos-Vázquez *et al.*, 2020).[3]

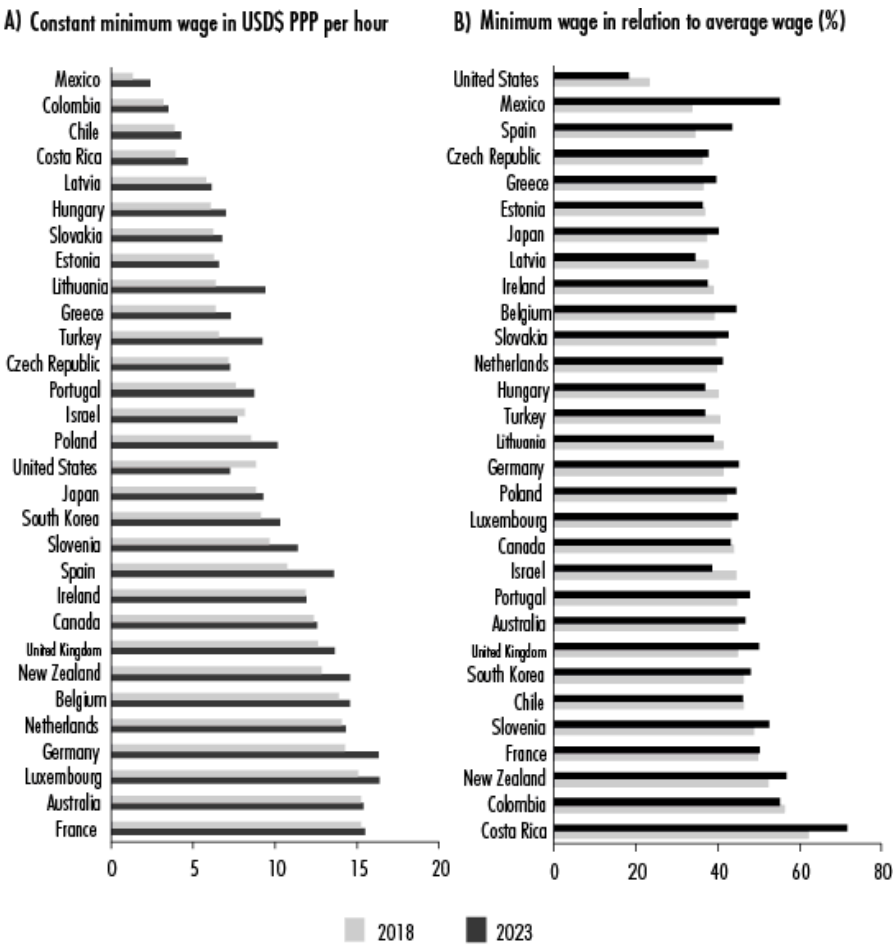
Figure 1. Real minimum wage in Mexico and other countries



Source: prepared by the authors with information from the ECLAC and the Banco de México. The information corresponding to Panel A is available in the Real Minimum Wage series at: https://statistics.eclac.org/portal/eclacstat/dashboard.html?lang=es. The real minimum wage in Mexico and the ZLFN was obtained from https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=10&accion=consultarCuadroAnalitico&idCuadro=CA601&locale=es. Panel A includes Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, the Dominican Republic, Trinidad and Tobago and Uruguay.

Panel A of Figure 2 shows the evolution of the real minimum wage in Purchasing Power Parity (PPP) in various Organization for Economic Cooperation and Development (OECD) countries. In Mexico, the minimum wage increased from US$1.3 to US$2.4 in constant PPP per hour between 2018 and 2023, the largest increase observed compared to other countries including Chile, Colombia and Costa Rica. This increase is consistent with the aforementioned cumulative growth, although it is important to note that the minimum wage level remains relatively low in international comparison. Meanwhile, Panel B shows that, during the same period, the ratio of minimum wage to average wage increased from 33.7% to 55.2%, an increase that had not been observed in any other country during those years. This international comparison reflects a significant increase in purchasing power observed in Mexico in recent years.

Figure 2. Minimum wage in Mexico and other countries



Source: prepared by the authors with information from OECDStats. Information on the minimum wage in real terms in PPP can be obtained from https://data-explorer.oecd.org/

In recent years, various studies have assessed the effects of the minimum wage on employment, wage structure, poverty and inflation, comparing the ZLFN as an intervention group and the rest of the country or certain cities in the country as a comparison or control group.[4] In terms of employment, no relevant negative effects were found at the aggregate city level using ENOE data or administrative data from the formal sector of the economy of the Mexican Social Security Institute (IMSS) (Campos-Vázquez *et al.*, 2020; Campos and Esquivel, 2021; CONASAMI, 2019; Fernández Bujanda, 2020; Martínez Gonzaléz, 2020; STPS, 2019). Previous evidence shows that the minimum wage has had zero effect on employment in Mexico, both in the period before the increase and in the case of the ZLFN until 2021.

The zero effect on employment is not due to a lack of change in workers' incomes. Empirical evidence indicates significant increases in the labor income of low-income workers (Campos and Esquivel, 2021). These increases, and their zero effect on employment, would appear to be important contributors to the minimum wage reducing the incidence of poverty (Campos and Esquivel, 2023). On the other hand, no significant effects on inflation were recognized and, if any were found, they would be of a lesser magnitude (Campos and Esquivel, 2020; Calderón *et al.*, 2023). Thus, the state of the literature in Mexico shows that the minimum wage has had positive effects on income and has contributed to reducing poverty, while its effects on employment and the level of inflation have been negligible or limited.

However, relevant studies have not yet focused on studying the country as a whole. It is possible that the minimum wage has a negative effect at the aggregate level and the above results indicate that the ZLFN simply did not fare as badly as the rest of the country. Thus, this study aims to measure the possible effects of the minimum wage on employment in Mexico in light of the sustained increase from 2019 to 2024.

To achieve this objective, two empirical strategies were employed: first, the evolution of total employment, employment by sex and formal employment in Mexico was compared with that of other Latin American countries in which the minimum wage has not increased significantly (see Figure 1). To do this, the Synthetic Control Method (SCM) was used to construct a counterfactual with similar Latin American countries where the minimum wage did not increase to the same extent (Abadie *et al.*, 2010; Abadie, 2021). This method allows Mexico (as the unit of study) to be compared with a similar comparison group of countries, formed by a weighted aggregation of employment in the comparison countries, where the weightings are obtained optimally by an algorithm that minimizes the differences (mainly in the main outcome variable)

between Mexico and the comparison countries before the study period (in this case, 2019). The SCM was recently applied to evaluate the effects of the minimum wage at the aggregate level in countries (Arnadillo *et al.*, 2024).

Second, a City-level strategy was employed in Mexico, using microdata from the ENOE. Cities where the minimum wage may have had a greater impact on employment are compared, given that the average wage is closer to the minimum wage than in cities with a higher average wage, where the effects should have been smaller.

The hypothesis is that the minimum wage should have had a greater impact on wages and employment in cities where it is a higher percentage of the average wage, as it could affect a larger number of workers in the labor market. An alternative strategy was also employed, using aggregate information at the industry-city level in a manner similar to that used in previous studies (Holtemöller and Pohle, 2020; Pérez Pérez, 2020; Roupakias, 2022). In this case, it would be expected that those industries-cities with a higher minimum wage to average wage ratio would experience more pronounced effects on employment.[5] The results generally indicate that the minimum wage has no significant negative effect on employment, both internationally and among cities with different average wages.

This article is structured in six sections, including this introduction. The second section briefly reviews the literature on minimum wages and employment at the international level. The third section presents the data and methodology used in the article. The fourth section presents the international-level results. The fifth section presents the results using aggregate data at the city level in Mexico. The sixth section provides final comments.

2. LITERATURE REVIEW

Currently, there is a wealth of literature studying the effects of the minimum wage on employment. The majority of recent evidence, primarily from advanced countries, has found a reduced effect of minimum wage increases on employment (Dube, 2019; Dube and Lindner, 2024). It should be noted that most studies for the United States have found negative effects on employment, particularly among young individuals and individuals with lower levels of education (Neumark and Shirley, 2022). Below is a brief review of the literature considering the various identification strategies used to analyze the effects of the minimum wage on employment.

One area for which there is still little literature is studies using country-level data. For instance, in a recent study, Arnadillo *et al.* (2024) evaluated the 19% increase in Spain's minimum wage in 2019, using the SCM to compare Spain with other European countries. Their findings show that the minimum wage has no negative effect on employment.

Another trend in literature includes articles that use aggregate information, taking advantage of variations in minimum wages inside countries. These articles use information from states or other types of units and consider a treatment group affected by the policy and a control group. In general, this literature focuses on groups that should be most affected by wage policies in terms of employment, such as young people or workers in certain industries where the minimum wage is more relevant due to lower wage levels.

One example of these studies is that of Dube *et al.* (2010), which generalizes the idea of Card and Krueger (1994) by comparing neighboring states with different wage policies. The authors use data from counties affected and unaffected by changes in the minimum wage in the United States over 60 years. They focus on the fast-food industry because it employs many low-income workers who are most affected by minimum wage increases. The results showed no negative effects on employment. Nevertheless, literature on the minimum wage is extensive, as aggregate data literature has found mixed results, although in general a reduced effect of the minimum wage on employment has been found (Addison *et al.*, 2012; Caliendo *et al.*, 2018; Jardim *et al.*, 2022; Orazem and Mattila, 2002).

Recent empirical strategies also compare states within a country using groups affected by the policy, employing recent techniques such as SCM. Jardim *et al.* (2022) address the issue using aggregate data from US cities. The authors take advantage of the minimum wage increase in Seattle between 2015 and 2016. Using administrative data from Washington state, they identify the effects on the extensive and intensive margins of employment. The authors found that there were moderate reductions in the intensive margin of employment, i.e., in hours worked, but not in the number of jobs. More broadly, Dube *et al.* (2015) used the SCM to study multiple cases of states in the United States between 1979 and 2013 in which the minimum wage increased. They found that wages significantly increased, but employment was unaffected.

Another way to study the possible effects of the minimum wage is to take advantage of the variation in how it affects various aggregate units. In this respect, the studies by Holtemöller and Pohle (2020), Pérez Pérez (2020) and Roupakias (2022) use region-industry or state-industry groups as units of aggregation, combining econometric methods of difference in difference and fixed effects. These studies also tend to consider various measures to calculate the possible sensitivity of employment to changes in the minimum wage. They use indicators such as the percentage of workers affected, the minimum wage relative to the average wage, and the distance of wages from the new minimum wage. The results of this literature generally show insignificant effects or small negative effects of the minimum wage on employment.[6]

3. DATA AND METHODOLOGY

Synthetic control at the international level

To analyze the effect of the minimum wage on employment, the SCM is used following Abadie (2021) and Abadie *et al.* (2010). Quarterly data on Latin American countries from the Labor Observatory of the Inter-American Development Bank (IDB) are used. The IDB compiles data on total employment, employment by sex and formal employment from statistical institutes or official sources in each country. Quarterly data was used to make the estimates, considering that some series have a monthly frequency and others have a quarterly frequency. To standardize this data, quarterly averages were obtained in cases where the frequency was monthly. In all cases, a base index of 100 was used for the fourth quarter of 2018.

Given that Mexico's wage policy was modified in 2019,[7] this year is used as the starting point for data analysis, with Mexico as the unit treated. The SCM is responsible for finding weightings for the different countries included so that the differences in observable characteristics are minimal before the study period.[8] The dependent variable itself (total or formal employment) is the observable characteristic used, but it is only used for up to half of the periods with different combinations of lags from 2016 to 2018.[9] Twenty-five models are estimated with these different combinations and the model with the lowest mean square error (MSE) is selected. Tables A5 and A6 in the Appendix show the lags included in the 25 models and the selected model in each case. For the inference analysis (statistical significance), the effect for each unit is obtained so that a group of placebos is constructed. i.e., the model is estimated once again for each placebo without including Mexico in the sample. If the effect of these estimates is smaller (in absolute value) than the true effect, greater reliability can be given to their statistical significance.[10] Those units with an MSE five times higher than that of the country under study were excluded. Table 1 shows the countries used in the four employment variables considered.

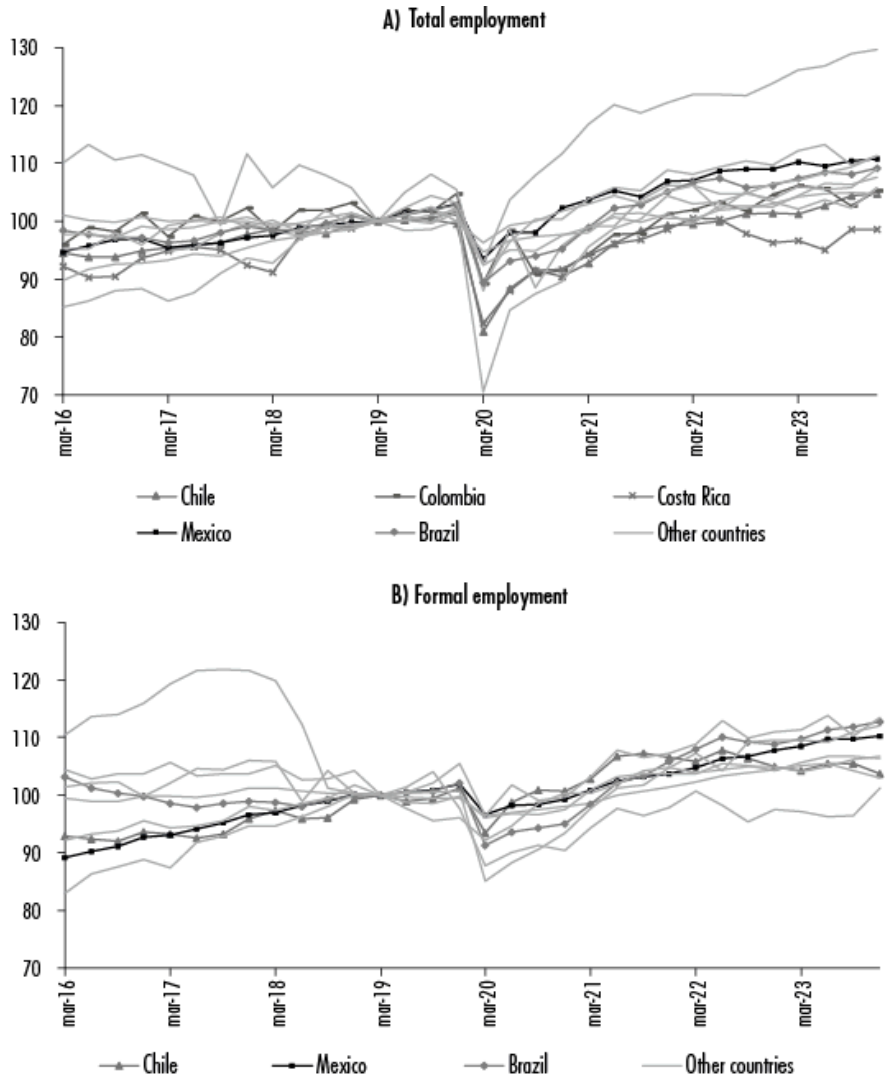
Table 1. Countries considered in the synthetic control for each variable

Country	*Formal employment*	*Employment*		
		Total	*Men*	*Women*
Argentina	x			
Barbados		x	x	x
Brazil	x	x	x	x
Bolivia		x	x	x
Chile	x	x	x	x
Colombia		x		
Costa Rica		x	x	x
Ecuador	x	x	x	x
Mexico	x	x	x	x
Nicaragua	x			
Peru	x	x	x	x
Dominican Republic	x	x	x	x
Uruguay	x	x	x	x

Source: prepared by the authors using information from the IDB Labor Observatory. This information can be found at https://observatoriolaboral.iadb.org/es/empleo_regional/

Figure 3 shows the evolution of total employment and formal employment in the selected countries. In general, it shows that Mexico has experienced higher employment growth than the rest of the economies, with both total employment and formal employment increasing by around 10% since the end of 2018. This cumulative increase has been higher than in countries such as Brazil, Chile, Colombia or Costa Rica, which have experienced moderate wage increases. Costa Rica is a particular example with a minimum wage that remained constant in real terms and with its ratio of minimum wage to average wage that increased slightly (see Figures 1 and 2). However, it has also shown a relatively constant level of employment.

Figure 3. Employment by country (Index 2018q4=100)



Source: prepared by the authors using information from the IDB Labor Observatory. The information can be found at https://observatoriolaboral.iadb.org/es/empleo_regional/

It should be noted that, during the Covid-19 pandemic, there was a significant drop in total and formal employment in all countries as a result of the shutdown of various activities. Notably, in Mexico, the decline in employment due to the economic crisis caused by the Covid-19 pandemic was less severe and the labor market recovered relatively faster than in other countries.

Figure 4 shows the evolution of total employment by sex. Notably, employment growth in Mexico has been relatively higher for both men and women, than in most Latin American countries. The dynamism of employment in Mexico is mainly due to total female employment, which had increased by almost 20% by 2024.

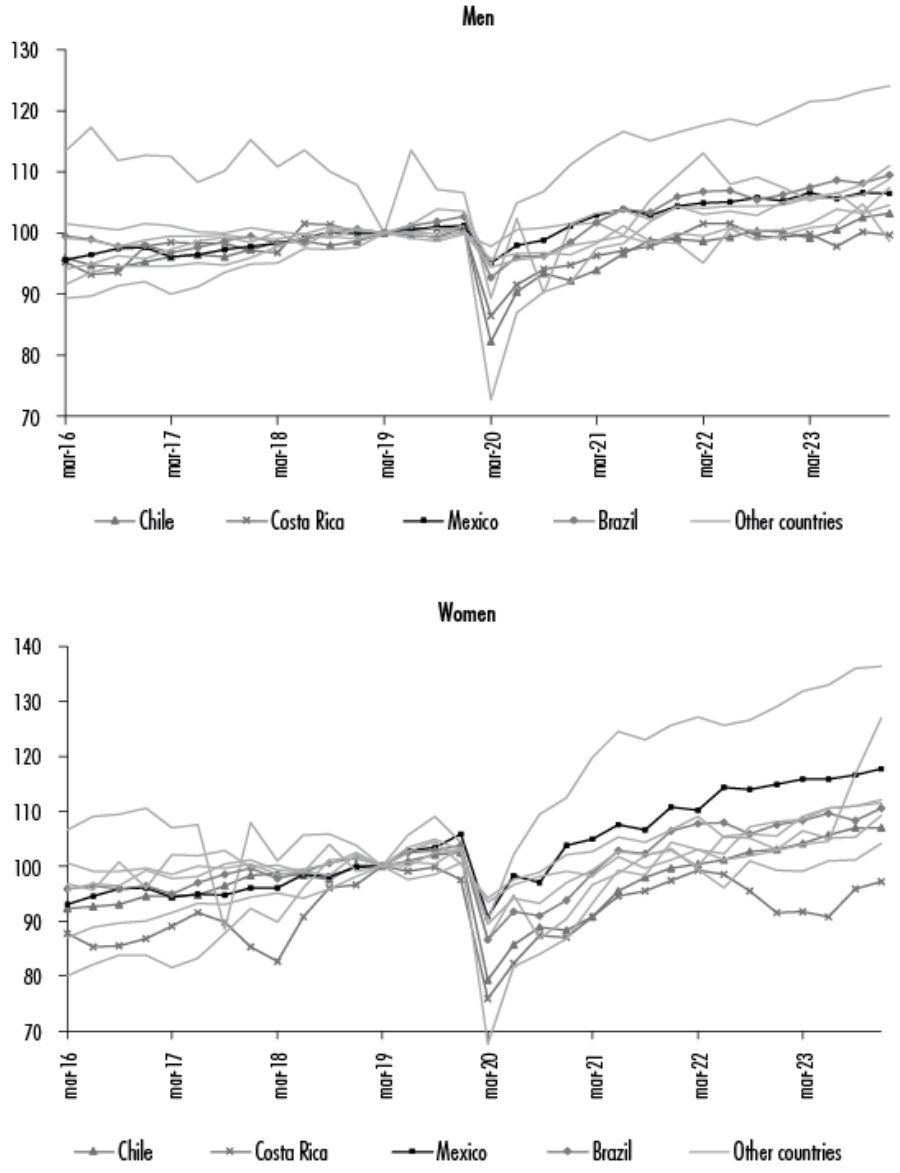
The dynamics of the Mexican labor market compared to other Latin American countries show that employment performance has been favorable in terms of total employment, formal employment and employment by sex. The recovery observed in the Mexican labor market was relatively faster than in other countries, in addition to the dynamism observed, particularly with regard to employment for women. Furthermore, when comparing Mexico, a country with a notable increase in wages, with countries that had moderate increases in their minimum wage, no aggregate evidence of possible negative effects on employment was observed in respect to Mexico.

City-level analysis

The ENOE was used to analyze the possible effects of the minimum wage on employment and average wages in the self-represented cities available in the data set. The National Consumer Price Index (INPC in Spanish) was used to deflate income items. Employment and wages

were considered for all workers, for the formal sector and for the informal sector. The Hot-Deck method was used to calculate missing income in accordance with Campos-Vázquez (2013). The Hot-Deck procedure is performed with the categorical variables, such as federal state, sex, age group, educational level, rural or urban locality type, formality status and the quarter for each observation.[11]

Figure 4. Total employment by sex (Index 2018q4=100)



Source: prepared by the authors using information from the IDB Labor Observatory. This information can be found at https://observatoriolaboral.iadb.org/es/empleo_regional

The ratio of the minimum wage with respect to the average wage observed in the fourth quarter of 2018 was calculated for each self-represented city. This indicator reflects the extent to which the minimum wage could affect each city's wage structure. Regarding employment, the cumulative percentage variation in total employment, formal employment and informal employment was obtained between the fourth quarter of 2018 and the fourth quarter of 2024. The cumulative real variation in the average wage was obtained for the same period.[12]

The heterogeneity of the self-represented cities in terms of the extent to which the minimum wage could affect the wage structure was used to review the possible effects of the minimum wage on employment and wage variables. Different figures were obtained for these outcome variables with respect to the wage pressure indicator. Likewise, a regression line weighted by the cumulative expansion factor of each self-represented city in the fourth quarter of 2018 is presented in each figure. This indicator represents the sum of that factor for the workers considered in the calculation. The statistics appendix presents the results of the weighted and unweighted regressions.

Additionally, the same average wage and employment measures were obtained at the industry level for each city in the sample, using the same wage pressure measure as in the previous case. A weighted regression analysis was performed considering the cumulative expansion factor for workers considered by each industry-city and fixed effects by industry and by city. The advantage of including these fixed effects is that they allow us to capture specific characteristics of each industry and city that remain constant over time, which helps us more precisely control the impact of the minimum wage on employment. This reduces the risk that unobservable factors will distort the estimation of the relationship between wage pressures and employment. At this level of analysis, an additional exercise is also presented using an alternative wage pressure indicator defined as follows:

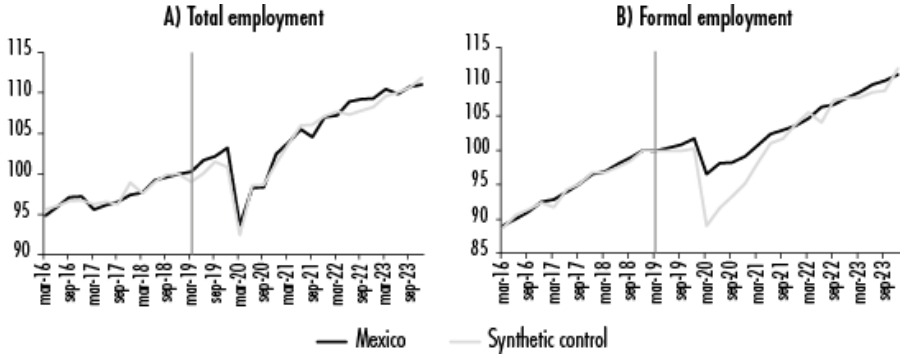
$$Fraction\ affected\ payroll_{i,j} = \frac{Affected\ payroll_{i,j}}{Total\ payroll_{i,j}} * 100$$

Where for each city *i* in industry *j*, we obtained the affected payroll, which is defined as the difference between the observed income of each worker with an income below the minimum in relation to the monthly income that would have been achieved with the 2024 minimum wage. In the denominator, we have the total payroll for each industry *j* in city *i*. This indicator reflects the degree of wage pressure associated with the cumulative increase in the minimum wage up to 2024. For example, the affected wage fraction indicator was 12.6% for the manufacturing industry in Monterrey, compared to 40.8% for the same industry in the State of Mexico. This means that cities with lower wages would be more affected by the wage increase policy.

4. SYNTHETIC CONTROL AT THE INTERNATIONAL LEVEL

Figure 5 presents the results of the synthetic control for total employment and formal employment. The comparison countries are those located in Latin America that are relatively comparable to Mexico. The left panel shows the evolution of total employment in Mexico compared to the synthetic control constructed from the countries in the sample. The results reveal that Mexico's employment trajectory is similar to that of the control group and the inference analysis shows no significant effects. This implies that there are no negative effects due to the increase in the minimum wage on total employment.[13]

Figure 5. Synthetic control results for total and formal employment (Index 2018q4=100)



Source: prepared by the authors using information from the IDB Labor Observatory. The model with the lowest mean square error is considered.

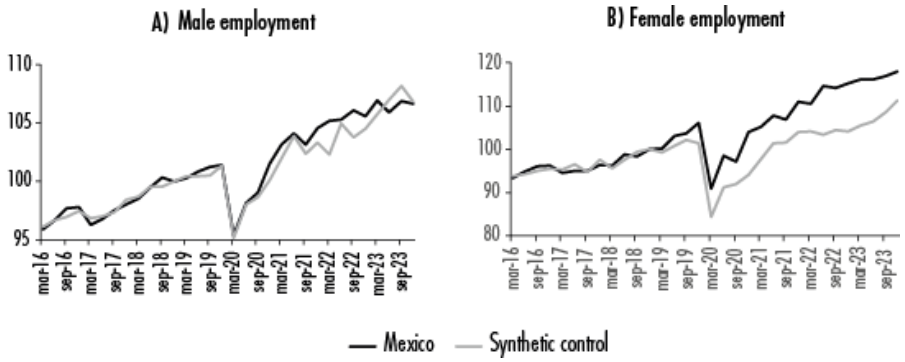
Similarly, Panel B presents the results for formal employment and no statistically significant negative effects are found. Furthermore, positive and statistically significant effects on formal employment are shown between the first quarter of 2020 and the first quarter of 2021. Thus, the evidence suggests that, rather than having negative effects on formal job creation, the opposite occurred, at least during part of 2020 and early 2021. This can also be explained by the greater negative effects of the decline in formal employment during the economic crisis associated with the COVID-19 pandemic on other countries. Nevertheless, taken together, these results indicate that the increase in the minimum wage did not have a significant negative impact on formal employment.

It is important to note that the inference exercise carried out has a limited number of placebos due to the number of countries used, as well as the units excluded, since their MSE is five times higher than that of the treated unit. Abadie (2021) does not specify a specific number of units for inference, but he emphasizes the importance of using control units similar to those of the treatment unit. He also mentions that a large number of units within the control group would introduce bias because the constructed synthetic control could be associated with random

variation in individual transitory shocks rather than genuine similarity between these units. Therefore, it was decided to have a reduced number of controls, although relatively similar to Mexico, even though the disadvantage is that the control units are reduced.

Figure 6 presents the results of the SCM for total employment of men and women. Panel A shows the results for men, indicating that the trajectory observed in Mexico with respect to the synthetic control is very similar. Although the inference analysis shows that there are no significant effects (see the Statistics Appendix), these results suggest that the minimum wage did not significantly impact total male employment. On the other hand, Panel B presents the results of the SCM for total female employment. The evolution of total female employment shows a more dynamic trajectory than that of the control group. In this respect, significant effects have been observed in the last three years. This shows that Mexico has performed better than the control group made up of Latin American countries in terms of employment and that the minimum wage does not appear to have significant negative effects.

Figure 6. Synthetic control results for total employment of men and women (Index 2018q4=100)



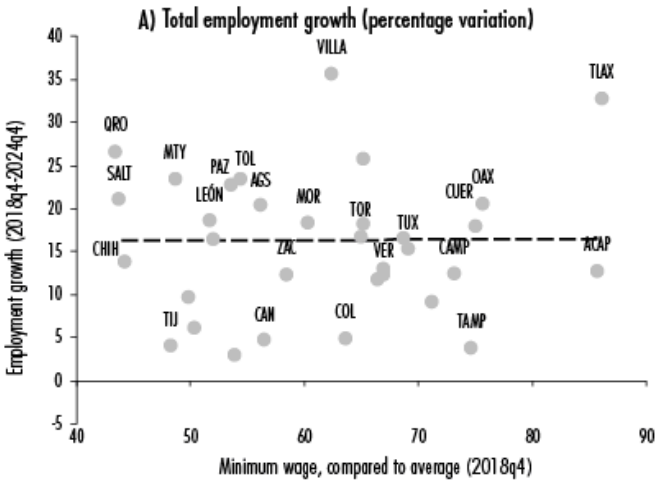
Source: prepared by the authors using information from the IDB Labor Observatory. The model with the lowest mean square error is considered.

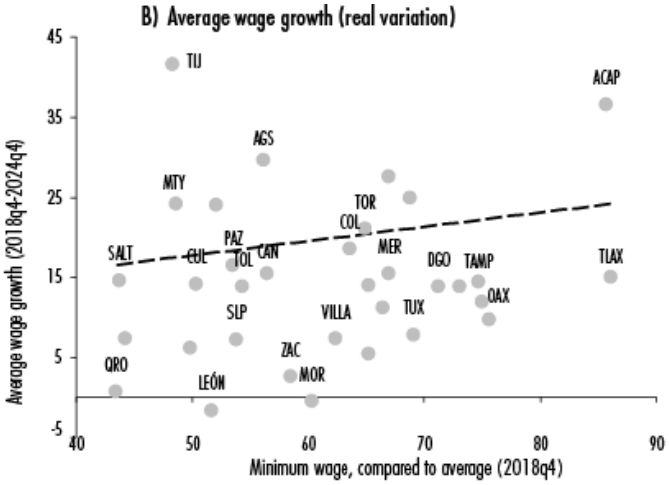
5. EMPIRICAL EVIDENCE IN SELF-REPRESENTED CITIES

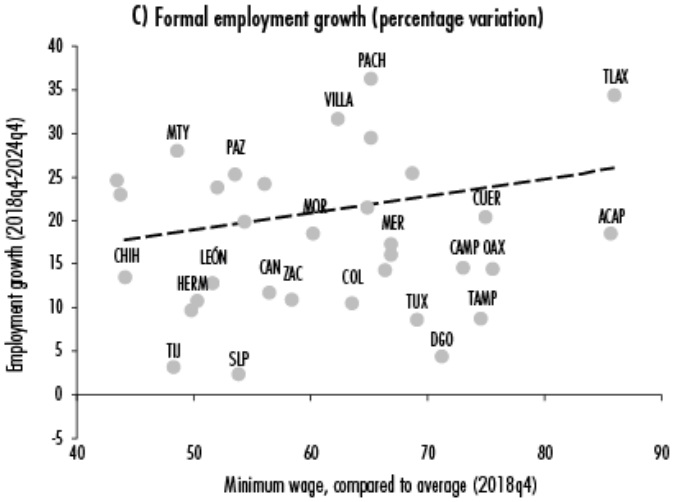
Evidence by self-represented city

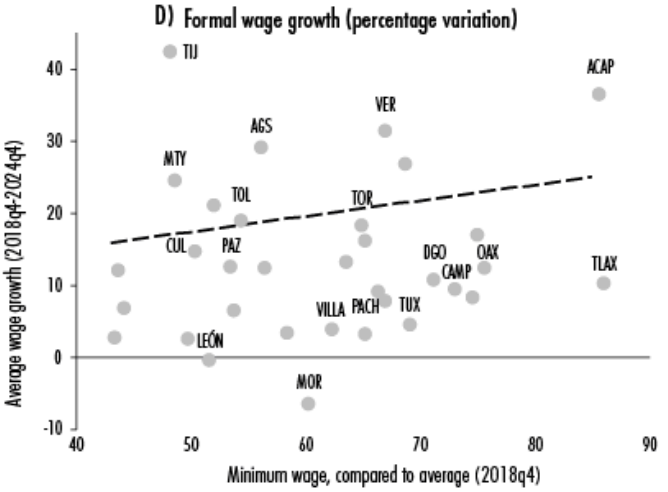
This section presents the results of the city-level analysis using self-represented cities included in the ENOE.[14] Figure 7 shows the results for total, formal and informal employment. The left panels show the relationship between the minimum wage and the average wage with the percentage growth in total employment between 2018 (fourth quarter) and 2024 (fourth quarter). The right panels show the relationship between the minimum wage, as a percentage, and the average wage in the last quarter of 2018 with the actual cumulative growth in average wages. The figures include the weighted regression line by the cumulative expansion factor up to 2018.[15] The statistics appendix includes the results of the regression, as well as regressions estimated with the previously defined alternative measure of wage pressures, considering the wage cost subject to the minimum wage increase relative to the wage cost.

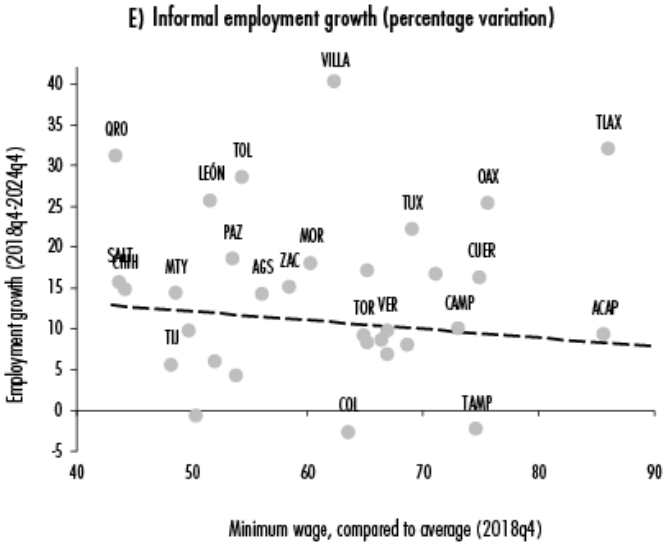
Figure 7. Growth in employment and average wages in self-represented cities

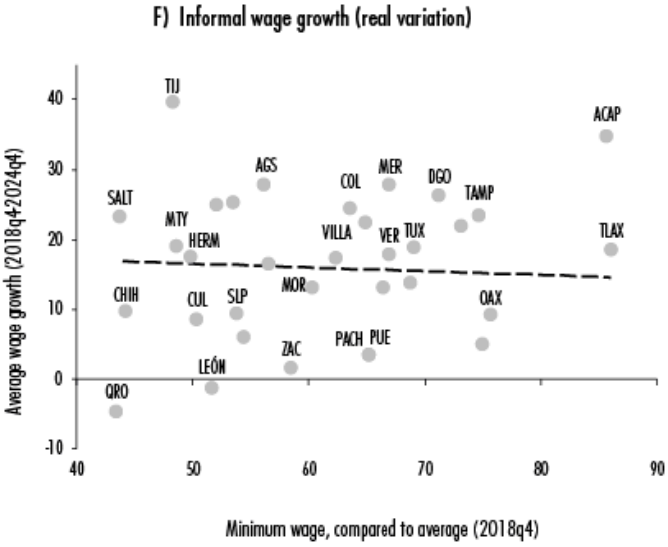












Source: prepared by the authors with information from the ENOE. The regression line is obtained with cumulative weightings by city in the fourth quarter of 2018. The results in the Statistics Appendix indicate that there are no significant relationships in any of the cases.

The impact of the minimum wage on employment has been widely debated in economic literature. From a competitive market perspective, an increase in the minimum wage should lead to a reduction in the level of employment. In this study, we hypothesize that cities where the minimum wage represents a larger percentage of the average wage will be the most affected in terms of employment.

Panels A and B present the results for the entire employed population. We expected to find a negative effect in cities where the minimum wage was relatively high compared to the average wage. However, the results do not show a clear relationship between the minimum wage level and employment. Nor is there a clear pattern in terms of wages. Furthermore, additional analyses in the Statistics Appendix confirm that there are no significant effects on employment or wages.

Meanwhile, panels C and D show the results for formal employment. These findings are relatively similar to those for the SCM, given that in cities where the minimum wage should have a more pronounced negative effect, a positive relationship with employment is observed, though it is not statistically significant.

Regarding formal wage growth, the results suggest a positive relationship between the minimum wage and the average wage. Nevertheless, as in the case of employment, these effects are not significant. Overall, the results do not indicate that the cumulative increase in the minimum wage has had a negative impact on formal employment.

Panels E and F show the results for the informal sector. In this case, there is a slightly negative relationship between the minimum wage and informal employment, although this is not statistically significant. Similarly, in terms of informal wages, no negative relationship with the minimum wage is identified.

In summary, the results do not confirm the hypothesis that a higher minimum wage compared to the average wage negatively impacts employment. The estimated effects for total employment, as well as formal and informal employment, are not statistically significant, suggesting that the cumulative increase in the minimum wage is not related to job losses.

Industry-level evidence by self-represented city

The following presents the results of employment growth at the industry-city level using the two measures of wage pressures. This approach allows us to take advantage of the country's sectoral and regional heterogeneity, considering industries that are potentially more sensitive to changes in the minimum wage. The sectors considered are agriculture, construction, manufacturing, trade, services and others.

Table 2 presents the results of wage and employment growth considering regressions weighted by the cumulative expansion factor (the unweighted ones are included in the Appendix). Panel A shows a positive, albeit insignificant, relationship with average wage growth, possibly because high wage industries are unaffected. In contrast, a significant negative relationship (at 90% confidence) is identified with formal employment growth: an additional percentage point in this ratio is associated with a 0.36 percentage point reduction in formal employment growth, indicating possible impacts in certain sectors. No significant effects are found in other employment categories.

Table 2. Relationship between minimum wage and employment growth

Variables	*Dependent variables*			
	Δ Average wage	*Δ Total employment*	*Δ Formal employment*	*Δ Informal employment*
Panel A. Independent variable: minimum wage relative to average wage				
Minimum to average wage	0.052	-0.022	-0.359*	0.223
	(0.1358)	(0.1627)	(0.1970)	(0.1972)
Observations	182	182	182	182
Adjusted R-squared	0.6240	0.3540	0.3435	0.2250
Panel A. Independent variable: affected wage fraction				
Affected wage fraction	0.119	0.104	-0.213	0.398
	(0.1648)	(0.2014)	(0.2135)	(0.2788)
Observations	182	182	182	182
Adjusted R-squared	0.6257	0.3561	0.3292	0.2368

Source: own estimates. Robust standard errors are used. The regression includes fixed effects by city and by industry. Aggregate weightings at the city level corresponding to the fourth quarter of 2018 are used. Observations with zero employment in any sector-city are excluded.

Panel B shows the results using the affected wage fraction as an independent variable. The interest coefficient is interpreted as the relationship between each percentage point of the affected wage share and the growth rate of the average wage and various employment categories. No significant effects are found in either average wage growth or employment categories, suggesting that the increase in the minimum wage does not appear to have had a significant impact on employment growth.[16]

6. FINAL COMMENTS

This article evaluated the effects of the minimum wage increase in Mexico since 2018 on employment, using two approaches: aggregate comparisons with Latin American economies and an analysis at the city and city-industry levels. Unlike previous studies focused on the ZLFN, this strategy considers the country as a whole.

The results show that there is no evidence of job losses following the increases. Mexico's employment trajectory is similar to that of other countries in the region, with no significant differences. However, differentiated effects were found by sex and in formal employment, which require further research to determine whether they are derived from substitution effects due to higher incomes.

In general, according to national, city and industry data, the wage recovery policy has not had negative effects on employment or the labor structure. Nevertheless, the analysis faces limitations due to the small number of control units in the SCM and some uncertainty in the city-industry results, in which some sectors may have been affected.

The absence of adverse impacts could be explained by the fact that, before 2018, the minimum wage remained low in absolute and relative terms. Experience suggests that, in developing economies, a low minimum wage relative to the average wage can be used as a policy tool to reduce poverty and improve incomes without harming employment. In the future, it will be important to continue evaluating its effects, especially since the relationship between the minimum wage and the average wage has increased, which could intensify its impact in the future.

7. STATISTICS APPENDIX

Table A1. Relationship between the minimum wage and real wage growth

Variables	*Weighted regressions*			*Unweighted regressions*		
	Δ Total employment	*Δ Formal employment*	*Δ Informal employment*	*Δ Total employment*	*Δ Formal employment*	*Δ Informal employment*
Ratio of minimum wage to average wage	0.179	0.218	-0.054	0.138	0.098	0.176
	(0.2115)	(0.2389)	(0.1899)	(0.1753)	(0.1873)	(0.1762)
Observations	33	33	33	33	33	33
Adjusted R-squared	0.0063	0.0138	-0.0284	-0.0066	-0.0213	0.0069

Note: Robust standard errors are used.

Source: Prepared by the authors.

Table A2. Relationship between minimum wage and employment growth at city level

Variables	*Weighted regressions*			*Unweighted regressions*		
	Δ Total employment	*Δ Formal employment*	*Δ Informal employment*	*Δ Total employment*	*Δ Formal employment*	*Δ Informal employment*
Ratio of minimum wage to average wage	0.005	0.195	-0.108	0.036	0.082	0.031
	(0.1261)	(0.1663)	(0.1525)	(0.1416)	(0.1391)	(0.1718)
Observations	33	33	33	33	33	33
Adjusted R-squared	-0.0322	0.0363	-0.0125	-0.0297	-0.0204	-0.0311

Note: Robust standard errors are used.

Source: Prepared by the authors.

Table A3. Relationship between the affected wage share and employment growth at the city level

Variables	*Weighted regressions*			*Unweighted regressions*		
	Δ Total employment	*Δ Formal employment*	*Δ Informal employment*	*Δ Total employment*	*Δ Formal employment*	*Δ Informal employment*
Affected wage fraction	-0.100	-0.030	-0.085	-0.003	0.005	0.039
	(0.1246)	(0.1897)	(0.1217)	(0.1357)	(0.1441)	(0.1453)
Observations	33	33	33	33	33	33
Adjusted R-squared	0.0042	-0.0303	-0.0174	-0.0322	-0.0322	-0.0300

Note: Robust standard errors are used.

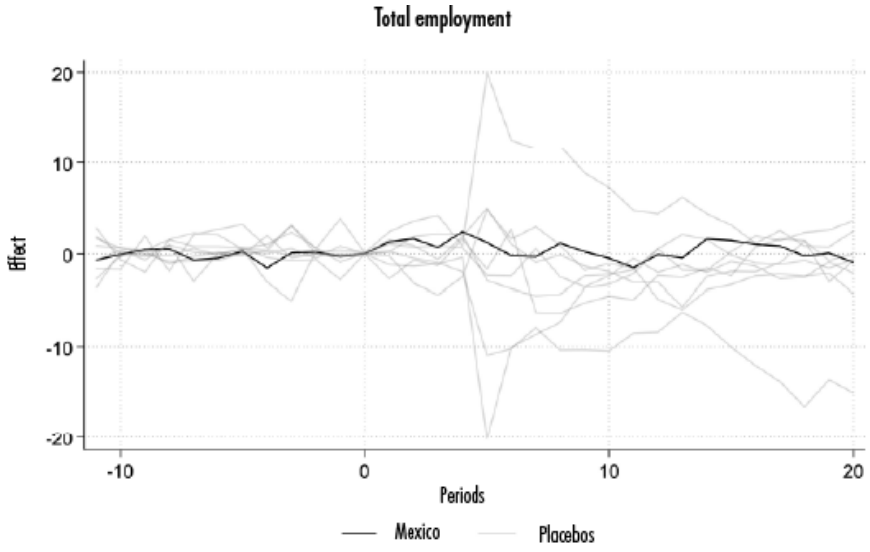
Source: Prepared by the authors.

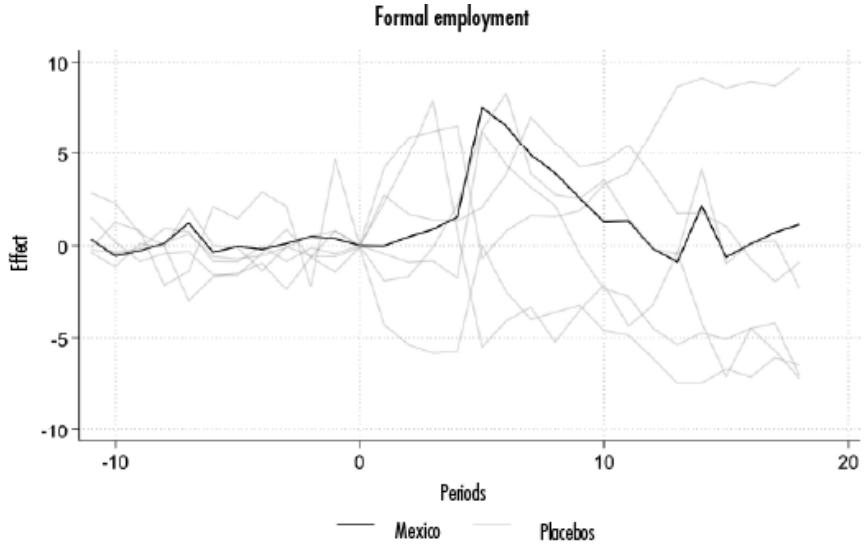
Table A4. Relationship between minimum wage and employment growth (unweighted)

Variables	*Dependent variable*		
	Δ total employment	*Δ Formal employment*	*Δ Informal employment*
Panel A. Independent variable: minimum wage in relation to average wage			
Minimum wage to average wage	0.427***	0.134	0.335
	(0.1411)	(0.1013)	(0.2390)
Observations	182	182	182
Adjusted R-squared	0.2579	0.0781	0.1640
Panel A. Independent variable: affected wage fraction			
Affected wage fraction	0.610*	0.036	0.779**
	(0.3202)	(0.2695)	(0.3918)
Observations	182	182	182
Adjusted R-squared	0.1710	0.0619	0.1690

Note: Robust standard errors are used. The regression includes fixed effects by city and by industry.
Source: prepared by the authors.

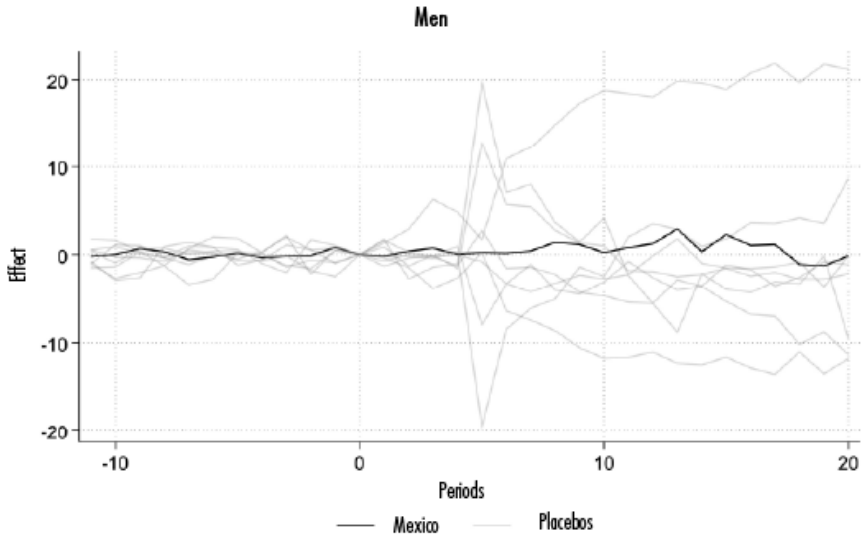
Figure A1. Effect on total and formal employment (placebo exercise)

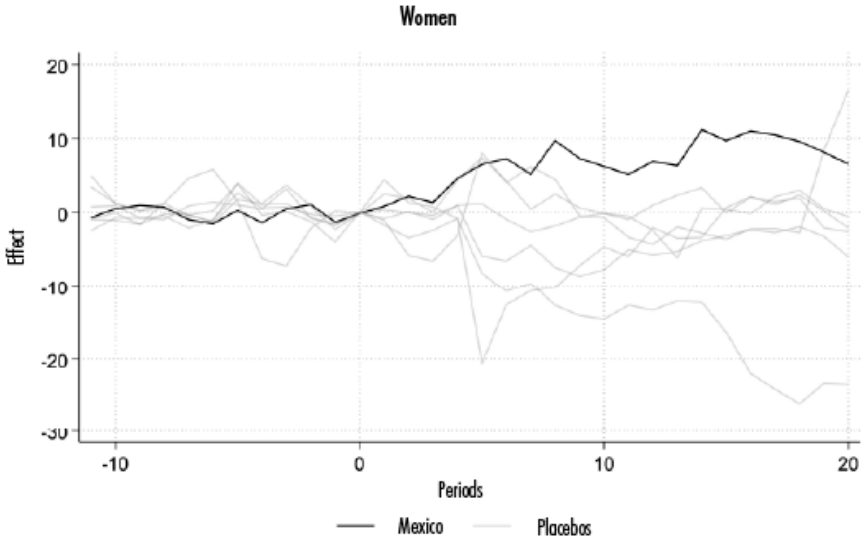




Note: Those with an MSE five times higher than that observed for the treatment unit are excluded from the exercise. The placebo effect corresponds to the difference between the observed and synthetic indices for each unit. Source: prepared by the authors.

Figure A2. Effect on total employment by sex





Note: Those with an MSE five times higher than that observed for the treatment unit are excluded from the exercise. The placebo effect corresponds to the difference between the observed and synthetic indices for each unit. Source: prepared by the authors.

Table A5. Models considered for each of the variables

Model	*Lags included*
1	2016q1, 2016q3, 2017q1, 2017q3, 2018q1, 2018q3
2	2016q2, 2016q4, 2017q2, 2017q4, 2018q2
3	2016q1, 2017q1, 2018q1
4	2016q2, 2017q2, 2018q2
5	2016q3, 2017q3, 2018q3
6	2016q4, 2017q4, 2018q3
7	2016q1, 2016q2, 2017q1, 2017q2, 2018q1, 2018q2
8	2016q2, 2016q3, 2017q2, 2017q3, 2018q2, 2018q3
9	2016q3, 2016q4, 2017q1, 2017q3, 2017q4, 2018q3
10	2016q1, 2016q4, 2017q1, 2017q4 2018q1, 2018q3
11	2016q1, 2016q2, 2016q3, 2016q4
12	2017q1, 2017q2, 2017q3, 2017q4
13	2017q4. 2018q1, 2018q2, 2018q3
14	2016q2, 2016q3, 2016q4, 2017q2, 2017q3, 2017q4
15	2017q2, 2017q3, 2017q4, 2018q1, 2018q2, 2018q3
16	2016q2, 2016q3, 2016q4, 2018q1, 2018q2, 2018q3
17	2016q1, 2016q3, 2016q4, 2017q1, 2017q3, 2017q4
18	2017q1, 2017q3, 2017q4, 2018q1, 2018q2, 2018q3
19	2016q1, 2016q3, 2016q4, 2018q1, 2018q2 2018q3
20	2016q1, 2016q2, 2016q4, 2017q1, 2017q2, 2017q4
21	2017q1, 2017q2, 2017q4, 2018q1, 2018q2, 2018q3
22	2016q1, 2016q2, 2016q4, 2018q1, 2018q2, 2018q3
23	2016q1, 2016q2, 2016q3, 2017q1, 2017q2, 2017q3
24	2017q1, 2017q2, 2017q3, 2017q4, 2018q1, 2018q2
25	2016q1, 2016q2, 2016q3, 2018q1, 2018q2, 2018q3

Source: prepared by the authors.

Table A6. Selected optimal models

Variable	*Selected model*
Total employment	2016q2, 2016q3, 2017q2, 2017q3, 2018q2, 2018q3
Formal employment	2016q1, 2016q3, 2016q4, 2018q1, 2018q2 2018q3
Male employment	2016q1, 2016q3, 2016q4, 2017q1, 2017q3, 2017q4
Female employment	2016q2, 2016q4, 2017q2, 2017q4, 2018q2

Source: prepared by the authors.

Table A7. Summary of results on employment

Category	*Findings*
International results	
Total employment	Insignificant effects
Men	Insignificant effects
Women	Significant positive effects (2021q1-2023q4)
Formal employment	Significant positive effects (2020q1-2021q4)
City-level results	
Total employment	Insignificant effects
Formal employment	Insignificant effects
Informal employment	Insignificant effects
Evidence at the city-industry level	
Total employment	Not significant
Formal employment	Significant negative effects at 10% on formal employment using the minimum wage relative to the average wage as the dependent variable
Informal employment	Not significant

Source: prepared by the authors.

Table A8. Summary of empirical strategies in literature

Unit of analysis	*Countries covered*	*Empirical strategy*	*Findings*
Country-level information	Spain	Synthetic control method	No significant effects on employment were found (Arnadillo et al., 2024).
Aggregate level information within a country	Mainly advanced countries, although there are studies in emerging economies	Differences in differences in affected states or groups; recently, the synthetic control method has also been used	Insignificant or reduced negative effects on employment (Addison et al., 2012; Caliendo et al., 2018; Dube et al., 2015; Jardim et al., 2022; Orazem and Mattila, 2002).
Region-industry level information	Advanced and emerging economies	Regressions using fixed effects at the regional or state level, and by sector	No significant or reduced negative effects on employment (Holtemöller and Pohle, 2020; Pérez, 2020; Roupakias, 2022).

Source: prepared by the authors.

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[1] The authors would like to thank the two anonymous reviewers for their comments, which significantly improved this paper. Any errors or omissions are the sole responsibility of the authors.

[2] These studies focus on employment, prices, poverty and income. In general, the minimum wage has had positive effects without significant negative impacts on prices or employment (Calderón *et al.*, 2023; Campos Vázquez and Rodas Milián, 2020; Campos-Vázquez and Esquivel, 2020; Campos-Vázquez and Esquivel, 2021; Campos-Vázquez and Esquivel, 2023; CONASAMI, 2019; Fernández Bujanda, 2020; Martínez González, 2020; STPS, 2019).

[3] Since 2018, the minimum wage has increased its purchasing power with respect to the moderate poverty line and extreme poverty line. Considering a family of 3.43 members where one member earns the minimum wage, their monthly income in 2018 covered 23.3% of the moderate poverty line, while by 2024 it covered 72.1% in the ZLFN and 47.9% in the rest of the country. Furthermore, in the case of the extreme poverty line, it went from covering 50.5% in 2018 to 140.8% in the ZLFN and 93.5% in the rest of the country.

[4] In terms of employment, a study conducted prior to the sustained increase that has taken place since 2018 found that the minimum wage standardization implemented in 2015 had no significant effect on employment (Campos *et al.*, 2017), results that are in line with Bouchot (2018) and López Paiz (2014).

[5] Additionally, estimates were obtained using an alternative measure of the potential effectiveness of the minimum wage, which refers to the percentage of the wage bill affected by the increase in the minimum wage.

[6] There is also evidence at the establishment level to estimate the effects of the minimum wage (Card and Krueger, 1994; Dube *et al.*, 2007; Harasztosi and Lindner, 2019). These studies have also found insignificant or moderate effects of the minimum wage on employment. For a summary of the literature mentioned in this section, see Table A8.

[7] The SCM has little precedent in the literature on minimum wage evaluation. Nevertheless, this method is considered viable given that the magnitude of the wage increase in Mexico was not observed in any of the control countries, although it could have statistical limitations.

[8] Formally, we have data from $J + 1$ units, where unit $J = 1$ is the treated unit. On the other hand, we have a set of donors from $j = 2, \ldots, J$. We have information on T periods with t = 1,…,T, where T_0 is the number of periods before treatment. We define Y_{it}^N as the result that should be observed in unit *i* without the treatment intervention (unobserved), while Y_{it}^I refers to the observed result. We are interested in observing the effect $\alpha_{it} = Y_{it}^I - Y_{it}^N$. This method allows us to find a valid counterfactual Y_{it}^N using a vector of weightings $W = (w_2, \ldots, w_{J+1})$ that minimizes the difference between the characteristics of the treated unit and those of the control unit $X_1 - X_0 W$ before treatment.

[9] Unlike other studies, which also include other control variables, only lags in the dependent variable are considered because the sample of countries is smaller and restricted to relatively similar countries, excluding advanced economies that have more significant differences in variables such as GDP per capita.

[10] This methodology assigns treatment to each control unit to generate placebos, enabling comparison of the effect observed in the treated unit with the distribution of placebo effects. According to Galiani and Quistorff (2017), the p-value is calculated as the proportion of placebo effects whose absolute magnitude is equal to or greater than the observed effect in the treated unit. Formally: $\text{p-value} = \frac{\sum_{j \neq 1} \mathbb{1}(|\hat{\alpha}_{jt}| \geq |\hat{\alpha}_{1t}|)}{J}$, where *J* is the number of placebos. Meanwhile, in the numerator, there is a function that indicates whether the absolute value of the effect of each placebo is greater than that of the treated unit.

[11] The Hot-Deck method is applied, bearing in mind that 36.6% of workers did not report their income in the fourth quarter of 2024, despite reporting that they had a job that provided an income. This method is used exclusively for this group of workers.

[12] The statistics appendix presents the regression results and as an additional analysis at the city level considering the fraction of the wage bill affected.

[13] The Appendix shows the considered models, the optimal models and the figures that include the statistical significance analysis. If the estimated effect of the synthetic control is not greater in absolute magnitude than the estimated effect for most units, then the estimated effect is considered not statistically significant.

[14] The following cities are included: Mexico City, Guadalajara, Monterrey, Puebla, León, Torreón, San Luis Potosí, Mérida, Chihuahua, Tampico, Veracruz, Acapulco, Aguascalientes, Morelia, Toluca, Saltillo, Villahermosa, Tuxtla Gutiérrez, Tijuana, Culiacán, Hermosillo, Durango, Tepic, Campeche, Cuernavaca, Oaxaca, Zacatecas, Colima, Querétaro, Tlaxcala, La Paz, Cancún, Ciudad del Carmen, and Pachuca. The city of Tijuana corresponds to the ZLFN.

[15] The expansion factor is obtained by adding together the factors of all the individuals considered from each self-represented city.

[16] Table A7 presents a summary of the employment results mentioned throughout the text, considering the different empirical strategies.