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**Article**

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Robert Tucker Omberg\*

# Puerto Rico's minimum wage: Revisiting a price floor with bite

## Abstract

Revisiting research from the 1990s from Castillo-Freeman and Krueger, I use the synthetic control method of Abadie et al. to estimate the impact of the most recent increase in the federal minimum wage on employment in Puerto Rico. I estimate that the employment/population ratio of various groups in Puerto Rico was significantly lower than that of a data-constructed synthetic Puerto Rico which did not raise its minimum wage. Placebo tests on other donor units, time periods, and population groups suggest that a significant portion of this gap is a result of the minimum wage. Groups with greater exposure to the minimum wage, such as teens and restaurant workers, experienced proportionally greater declines in employment. My results suggest an own-wage elasticity of employment in Puerto Rico of  $-0.68$ , higher than estimates from the mainland, which suggests that the employment response to minimum wages may be more dramatic at higher relative minimum wages.


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## Part I

### 1 Introduction

The employment effect, or lack thereof, of the minimum wage remains a contentious issue in empirical economics, but a significant amount of progress on the issue has been made since the dueling studies of Card and Krueger (1993) and Neumark and Wascher (1995). Modern research on the minimum wage generally finds an employment response that is negative, small, and mostly localized to groups such as teenagers (Wolfson and Belman (2019), Neumark and Shirley (2021)). However, most studies use variation in state and local minimum wages to identify the effect of the minimum, and states and localities in the United States have generally chosen minimum wages that are modest relative to their median wages. In Cengiz et al.'s (2019) comprehensive study of state level minimum wage changes, for example, the highest relative minimum wage was 59% of the median wage.

With current proposals to dramatically increase the federal minimum wage to \$15/h being considered by policymakers, the current literature on the employment effects of the minimum wage may be ill-equipped to forecast the effects of much larger minimum wage increases. A federal minimum wage of \$15/h would be 95% of the median wage in Mississippi and 87% of the median wage in West Virginia if implemented immediately, for example. Such an increase is far beyond those studied by the majority of the minimum wage literature. The employment effects of such a high minimum may be better gauged by looking to the US territory of Puerto Rico, which has been bound by the Federal Minimum wage since 1983. While Puerto Rico is wealthier than other Caribbean countries, with Gross Domestic Product (GDP) per capita in 2020 equal to roughly \$31,000, compared to \$9,000 in Jamaica, \$18,000 in the Dominican Republic, and \$25,000 in St. Kitts and Nevis, it is simultaneously poorer than the U.S. states with which it shares Federal Laws. GDP per capita for all states was \$65,281, nearly double Puerto Rico's, and even the poorest states like Mississippi (\$40,000) and West Virginia (\$43,000) are still much wealthier than Puerto Rico. Average hourly earnings in Puerto Rico were equal to \$12.21 in 2010, compared to \$21.92 for the mainland United States, \$17.74 for Mississippi, and \$17.65 in West Virginia. This results in Puerto Rico having a relative minimum wage that is much higher than any other state. Most recently, in 2007, the Federal Minimum Wage was increased from \$5.15/h, which was 59% of Puerto Rico's median wage at the time, to \$7.25/h, 76% of the median wage. Estimating the effect of this increase on Puerto Rican employment might provide insight into whether the minimum wage has a modest disemployment effect even at higher relative levels.

This paper revisits the question of the minimum wage in Puerto Rico using the most recent increase in the federal minimum wage as a case study. Since there is no *a priori* sensible control group to use for Puerto Rico, such as a neighboring state with a higher minimum wage, I utilize Abadie et al.'s (2010) synthetic control method, constructing a plausible counterfactual for the path of Puerto Rican employment without the minimum wage increase using the labor markets of other nations, Puerto Rican industries less affected by the minimum wage increase, and cities on the mainland United States. Identification is threatened by the Great Recession of the late 2000s, which coincided with the minimum wage increase and was particularly pronounced in Puerto Rico. To combat this potential source of bias, I use triple differences strategies comparing the estimated employment effects of groups with differential

exposure to the wage floor and find that groups with lower wage levels and thus more exposure to the minimum experienced proportionally larger relative decreases in employment. I also construct a synthetic Puerto Rico matching on fluctuations in pre- and post-treatment GDP per capita, rather than just pre-treatment employment, creating a counterfactual which experienced similar macroeconomic fluctuations during the post-treatment period. I find that the increase in the minimum wage lead to substantial reductions in Puerto Rican employment across all specifications. On average, my results suggest an own-wage elasticity of employment of  $-0.68$ , larger than estimates from previous studies of the minimum wage in the United States, which are generally in the  $-0.3$  to  $-0.5$  range. I discuss several reasons why the employment response to the minimum wage may have a non-constant elasticity. Alternative avenues by which employers may choose to adjust, such as cuts to hours or fringe benefits, have a limited capacity to absorb higher labor costs, leaving cuts to employment as the only remaining option at higher relative minimum wages. A higher minimum wage is also more likely to bind in the tradable goods sector, where employment is demonstrated to be much more sensitive to minimum wage increases due to more elastic product demand.

The remainder of the paper is organized as follows. Part II gives a brief summary of the state of the literature on the employment effects of minimum wages and previous investigations into Puerto Rico more specifically. Part III provides background on the minimum wage in Puerto Rico and provides evidence that the 2007 increase in the minimum lead to a large increase in hourly wage. Part IV explains the synthetic control method, and Part V presents my results. Finally, Part VI concludes.

## Part II

### 2 Prior Research

Research on the employment effects of the minimum wage is as voluminous as it is controversial. As Neumark and Shirley (2021) summarize: depending on what one reads about how economists summarize the evidence, one might conclude that: (1) it is not well-established that higher minimum wages do not reduce employment, (2) the evidence is very mixed with effects centered on zero with no basis for a strong conclusion one way or the other, or (3) most evidence points to adverse employment effects (p. 2). In general, however, the evidence seems to be synthesized into supporting an employment effect of the minimum wage that is negative, small, and localized within subgroups such as teens and high school dropouts. In their meta-analysis summarizing the past 15 years of research on the employment effects of the minimum wage, Wolfson and Belman (2019) summarize the consensus range of elasticities of teen employment to the minimum wage as being  $-0.13$  to  $-0.07$ , implying that a 10% increase in the minimum wage decreases employment among teenagers by between 1.3% and 0.7%. Neumark and Shirley's (2021) meta-analysis reaches similar conclusions, with a median elasticity of  $-0.11$ . The majority of this research relies on evidence from the United States, where cross-state differentials in the minimum wage generate natural experiments useful for identifying the employment effect. The average US minimum is 39% of the median wage and the largest minima are just above 50% of the median (Cengiz et al., 2019).

The idea of using Puerto Rico to examine the effects of a high relative minimum wage is not a new one. Santiago (1986) sought to examine the employment and unemployment effects of the minimum wage in Puerto Rico soon after the gap between the continental and Puerto Rican minima closed around 1983. Using multivariate time series techniques and transfer functions, Santiago concluded that the empirical findings suggest that both disemployment and unemployment effects resulted from the post-1974 minimum wage policy ... consistent with theoretical hypothesis (p. 308). Soon after the revival in interest in minimum wage research in the 1990s, Castillo-Freeman and Freeman (1991) published research on the minimum wage's effect in Puerto Rico, primarily utilizing time-series data for their analysis. The authors found significant impacts on employment, concluding that—

Imposing the U.S.-level minimum reduced total island employment by 8–10% compared to the level that would have prevailed had the minimum been the same proportion of average wages as in the United States. In addition, it reallocated labor across industries, greatly reducing jobs in low-wage sectors that had to raise minima substantially to reach federal levels (p. 178).

Castillo-Freeman and Freeman's average estimate of the elasticity of employment to the minimum wage was  $-0.41$ . Two years later, Alan Krueger reexamined the impacts of the minimum wage in Puerto Rico, and reached different conclusions from Castillo-Freeman and Freeman, stating—

The strongest evidence that the minimum wage had a negative effect on employment in Puerto Rico comes from an aggregate time series analysis. The weakest evidence comes from cross-industry analyses. In general, however, I think one would have to consider the evidence surprisingly fragile ... perhaps the conclusion that one should reach from the review of evidence is that the jury is still out on Puerto Rico's experience (p. 23).

In the 14 years since then, statistical techniques for casual inference have come a long way, but the evidence from Puerto Rico still lies unexamined with a fresh set of statistical eyes. Dube and Zipperer (2015) only cite the Freeman and Krueger papers in a 2015 report on Puerto Rico, and David Neumark noted in 2018 that “surprisingly, to the best of my knowledge the evidence from Puerto Rico has not been revisited” (p. 9).

Beyond Puerto Rico, Gregory and Zierahn (2020) study another instance of a high relative minimum wage. In 2006, Germany's minimum wage for roofers increased, leading to a statutory minimum wage that was equal to or even exceeded the median wage in low-wage areas in eastern Germany. The authors conclude that the minimum wage caused the wages of low-skilled East Germans to increase by 5–6%, but also caused employment among that group to decline by 3.5%, suggesting an own-wage elasticity of  $-0.58$  to  $-0.70$ .

## Part III

### 3 Background

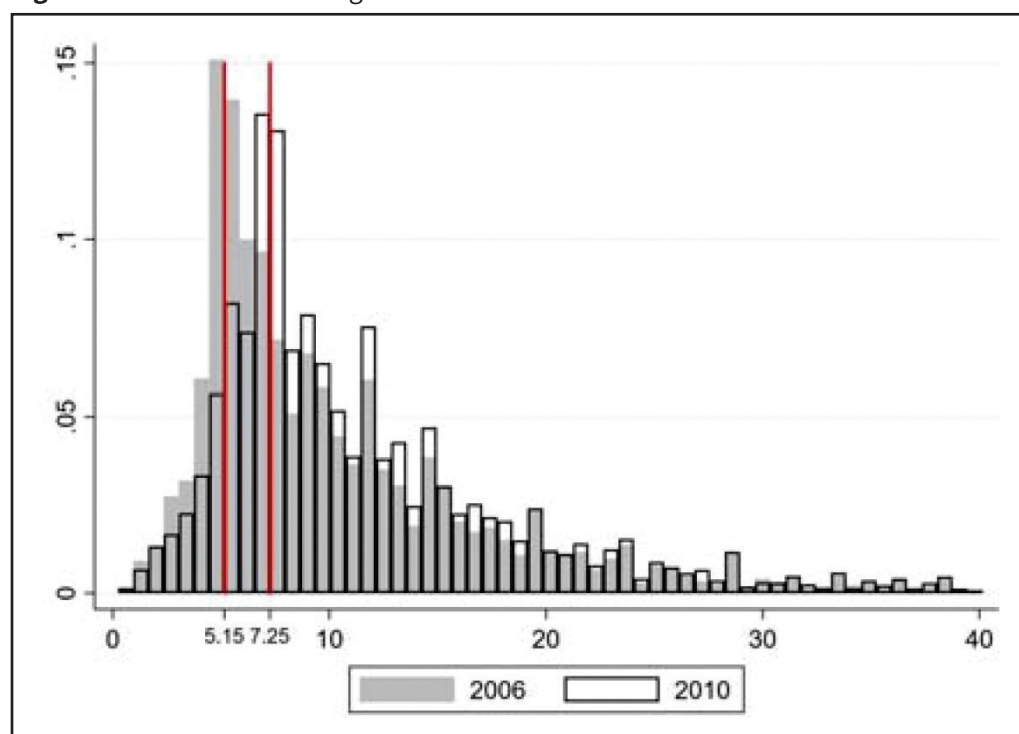
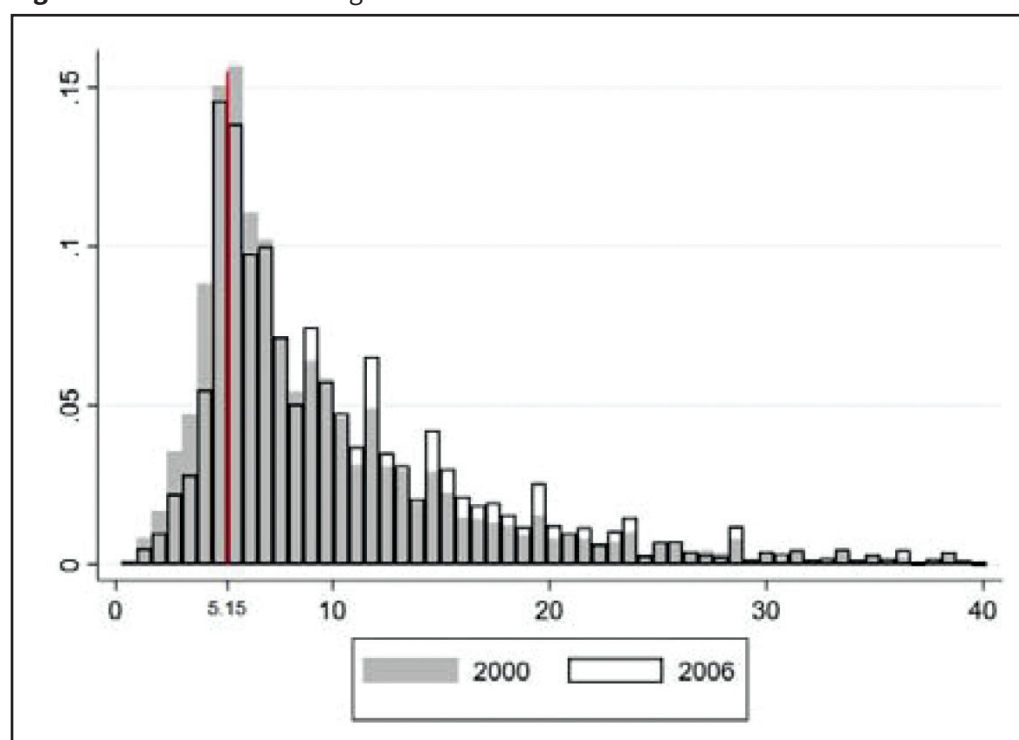
When the United States created its first national minimum wage through the Fair Labor Standards Act of 1938, Puerto Rico was exempted from the wage floor of \$0.35 for fear that the resultant disemployment effects would devastate the island's economy (Castillo-Freeman and Freeman, 1991, p. 178). Instead, the law established committees to set separate minimum

wages for various Puerto Rican industries and occupations. In the 1970s, however, the industry committee method of setting the island's minimum wage was gradually replaced until, by 1983, Puerto Rico was essentially covered by the federal minimum wage. The most recent increase in Puerto Rico's minimum wage occurred with the Fair Minimum Wage Act of 2007, which was introduced by Representative George Miller in January 2007 and signed into law in May of the same year. The act increased the federal minimum wage of \$5.15/h RST to \$5.85/h in July of 2007, then to \$6.55/h in July of 2008, and then finally to \$7.25/h 1 year later. Table 1 contains summary statistics for Puerto Rico and the United States in both – 2006, prior to the phase-in of the \$7.25/h minimum wage, and 2010, after its completion.

It's possible that, although the statutory minimum wage for Puerto Rico is high, its actual effect on workers' wages was mitigated by noncompliance on the part of employers. Perhaps workers shift into more informal work arrangements where the minimum wage is not in effect in reaction to the higher price floor. If this were the case, then Puerto Rico may actually be an inappropriate case study for examining the employment effect of the minimum wage. One way to test this possibility is to compare the distribution of hourly wages in Puerto Rico just before and just after the minimum wage increase. If the increase really did result in higher wages, then we should expect to see a dramatic decrease in the number of workers earning below the new minimum of \$7.25 and a corresponding increase in workers earning \$7.25. Using microdata from the 2000, 2006, and 2010 Puerto Rico Community Surveys (PRCS), I constructed the distribution of hourly wages on the island before the minimum wage increase in 2006 and after the completion of the phase-in in 2010. Comparing the wage distributions before and after the minimum wage increase, spikes are evident at the area of the minimum both before and after the increase, suggesting that a great number of Puerto Rican jobs were shifted into compliance with the new \$7.25 minimum wage (Figure 1). I also examine the difference between the 2000 and 2006 distributions in a placebo test, where the minimum wage was fixed at \$5.15 for both years. If the difference in the wage distributions between these 2 years is similarly dramatic, then we may be cautious in interpreting the difference between the 2006 and 2010 distributions as a result of the minimum wage increase. The difference between the 2000 and 2006 distributions in Figure 2 are comparatively small, with both exhibiting a spike at the contemporary

**Table 1** Characteristics of Puerto Rican Workers

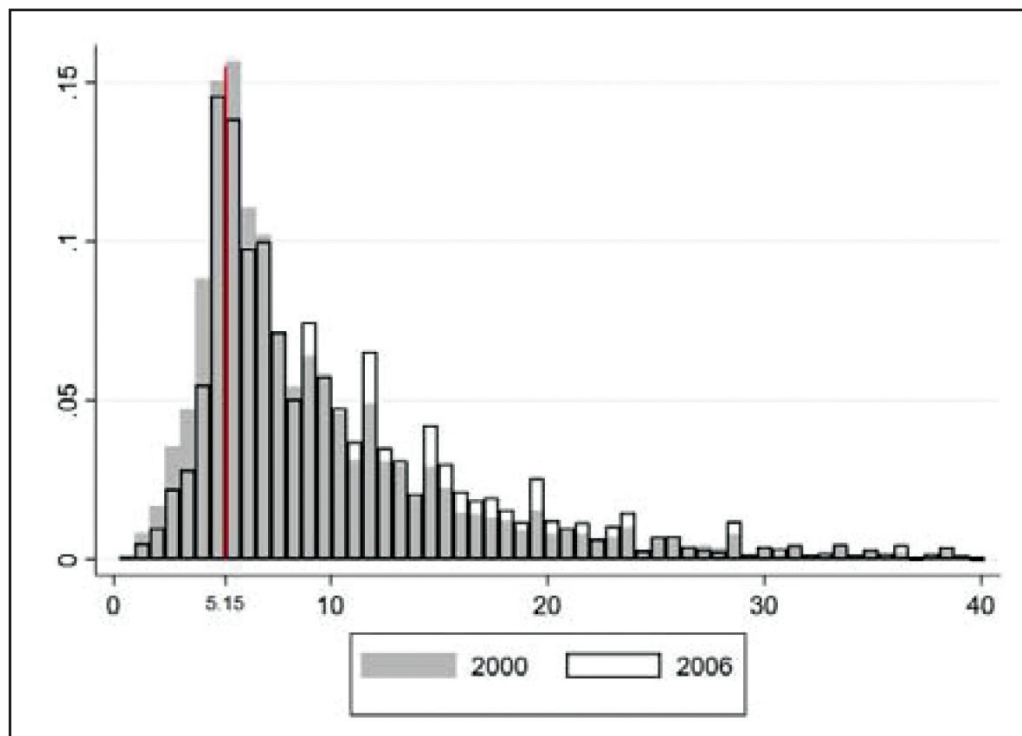
| Group                  | Count     | % Male | % Employed | Average Hourly Earnings (\$) | % Making \$7.25/h or less |
|------------------------|-----------|--------|------------|------------------------------|---------------------------|
| Puerto Ricans (2006)   | 34,746    | 47.18  | 29.92      | 11.34                        | 46                        |
| Ages 15–24             | 4,900     | 51.78  | 23.53      | 6.56                         | 76                        |
| Accommodation and Food | 822       | 50.49  | N/A        | 7.38                         | 69                        |
| Puerto Ricans (2010)   | 36,032    | 47.15  | 29.26      | 12.21                        | 35                        |
| Ages 15–24             | 4,982     | 51.45  | 19.41      | 8.36                         | 58                        |
| Accommodation and Food | 842       | 51.61  | N/A        | 8.77                         | 55                        |
| All Americans (2006)   | 2,969,741 | 48.61  | 46.84      | 21.49                        | 12                        |
| Ages 15–24             | 3,80,233  | 51.17  | 45.76      | 10.19                        | 30                        |
| Accommodation and Food | 1,16,917  | 41.92  | N/A        | 11.45                        | 41                        |
| All Americans (2010)   | 3,061,692 | 48.63  | 44.87      | 21.92                        | 10                        |
| Ages 15–24             | 3,85,912  | 51.37  | 40.10      | 10.72                        | 24                        |
| Accommodation and Food | 1,12,864  | 43.81  | N/A        | 11.98                        | 32                        |

**Figure 1** Distribution of Wages in Puerto Rico in 2006 and 2010.**Figure 2** Distribution of Wages in Puerto Rico in 2000 and 2006.

minimum of \$5.15. These results imply that the Fair Minimum Wage Act of 2007 was a major determinant of the actual wages that Puerto Ricans were paid. For another comparison, Figure 3 displays the change in the wage distribution in US states affected that are bound by the minimum wage increase. There is a clear decline in jobs below the new minimum with a corresponding increase in jobs paying the new minimum, but the effect is significantly less dramatic than the one seen in Puerto Rico.



**Figure 3** Distribution of Wages in U.S. States with Subfederal Minimum Wages in 2006 and 2010.



## Part IV

### 4 Methods

The unique difficulty of addressing the impacts of any policy on Puerto Rico is the absence of an a priori sensible control group. When examining the impact of state minimum wage increases on the continental United States, previous research most commonly utilized neighboring states which did not increase their minimum wage as a control group (Dube et al., 2010, Cengiz et al., 2019). This strategy is inappropriate for Puerto Rico due to both the island's unique geographic position and relatively low level of economic development relative to the mainland United States. With this in mind, I chose to use a method of policy analysis unavailable to either Castillo-Freeman and Freeman or Krueger in the 1990s: the synthetic control methodology first introduced by Abadie et al. (2010). The intuition behind synthetic control methods are simple: by constructing a synthetic version of the treated unit consisting of a weighted average of donor units which minimizes the pre-treatment root mean squared error (RMSE) in the dependent variable and other predictor variables, the post-treatment behavior of the synthetic unit can be analyzed as the counterfactual of the treated unit had the treatment not taken place. Thus the effect of the treatment on treated unit 1 in post treatment period  $t$  on dependent variable  $\delta$  be written as:

$$\alpha 1_t = \delta_{at} - \delta_{st}$$

where  $\delta_{at}$  and  $\delta_{st}$  are the levels of the dependent variable in the actual and synthetic treated unit at time  $t$ .

After constructing the treatment effects using the synthetic control for the treated units, statistical significance can be determined by running placebo tests. By estimating the same model on each untreated donor unit, while disallowing the treated unit to be used as a donor, one



can generate a distribution of effect sizes for the placebo unit. If the size of the treatment effect for the treated unit is much larger than those generated for the untreated units, then it is unlikely that the estimated effect was the result of chance. If the distribution of placebo effects at time  $t$  is  $\hat{\alpha}_{it}^{PL} = \{\hat{\alpha}_{jt} : j \neq i\}$ , then the two-sided and one-sided p-values for period  $t$  are:

$$p\text{-values}_{2s} = \Pr ob(|\hat{\alpha}_{it}^{PL}| \geq |\hat{\alpha}_{it}|)$$

$$p\text{-value}_{1s} = \Pr ob(\hat{\alpha} \geq \hat{\alpha}_{it})$$

If some placebo units have poor matches than the p-values may be too conservative. Galiani and Quistor (2017) recommend two methods for adjusting p-values for the quality of pre-treatment  $t$ . The first of these is that donor units which exceed a certain pre-treatment RMSE can be dropped from the distribution  $\hat{\alpha}_{it}^{PL}$  for the calculation of the p-values; alternatively, all effects can be divided by the pre-treatment  $t$  to generate pre-treatment adjusted p-values.

One final test for significance is the placebo date test, where a model for the treated unit is estimated with the same parameters except for the treatment period. If the effects seen during the initial estimation are causally related to the treatment, then one should expect small and insignificant differences between the actual and synthetic unit following the placebo date.

## Part V

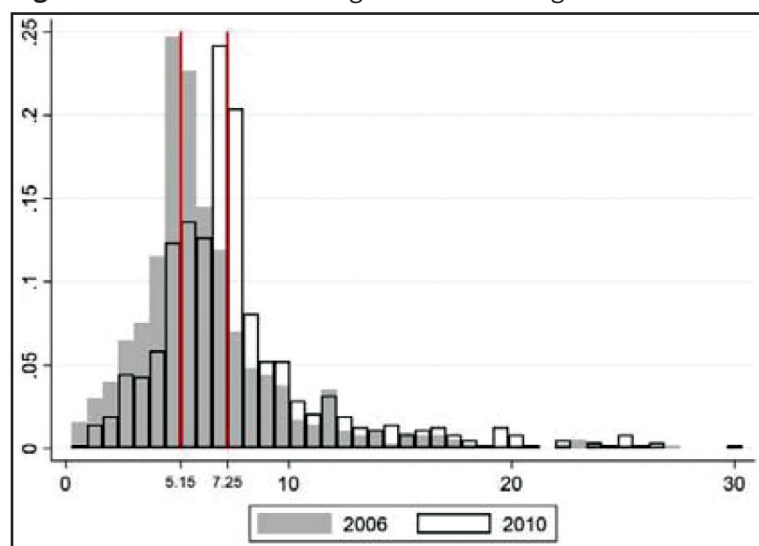
### 5 Results and Discussion

#### 5.1 Teens/Young Adults

##### 5.1.1 Full Donor Pool

Previous research on the minimum wage has used teenagers and other younger workers as a proxy for workers bound by the increase. In Puerto Rico, young workers between the ages of 15 and 24 were significantly more likely to be bound by the minimum wage increase, with 75% of workers aged 15–24 earning below \$7.25 per hour in 2006 just before the passage of the Fair Minimum Wage Act of 2007 (Figure 4).

**Figure 4** Distribution of Wages for Workers Aged 15–24 in Puerto Rico in 2006 and 2010.

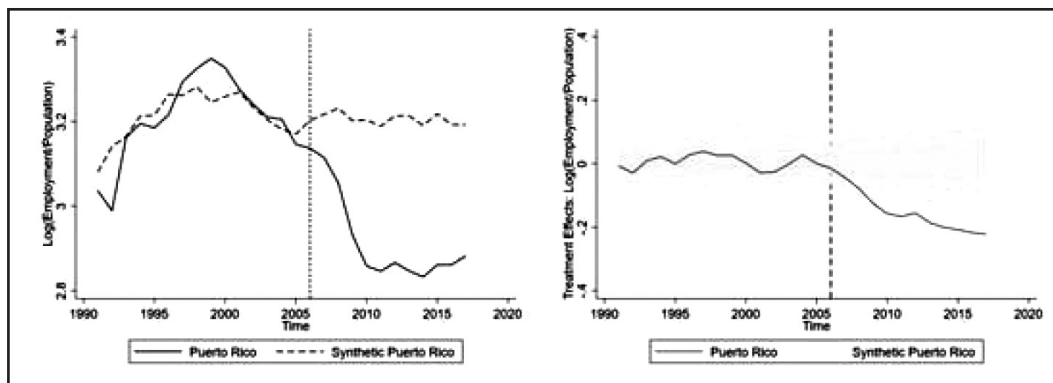


**Table 2** Weights for Constructing Synthetic Puerto Rico

| Country   | Weight |
|-----------|--------|
| Suriname  | 0.349  |
| Norway    | 0.328  |
| Macedonia | 0.16   |
| Gabon     | 0.16   |
| Lesotho   | 0.003  |

**Table 3** Indicators in Puerto Rico vs. Synthetic Puerto Rico

| Indicator                  | Puerto Rico | Synthetic Puerto Rico |
|----------------------------|-------------|-----------------------|
| GDP Growth (%)             | 3.71        | 2.18                  |
| GDP per capita (\$)        | 29,043      | 25,731                |
| Male Teen Population (%)   | 9.0         | 8.4                   |
| Female Teen Population (%) | 8.2         | 8.1                   |

**Figure 5** Treatment E effects and Placebo Test: Teen Employment (International Donors).

Source: (A) Actual vs. Synthetic Control. (B) Placebo Test.

Using the International Labor Organization's modeled estimate of the employment to population ratio for workers 15–24, as well as data from the World Bank on income per capita, GDP growth, and share of the population within the 15–24 year old range, I construct a synthetic control for Puerto Rico using 197 other countries as donors. The synthetic control algorithm, unsurprisingly, placed high weights on countries geographically close to Puerto Rico (Suriname) or at similar levels of economic development (Gabon), but also, somewhat puzzlingly, placed a high weight on Norway (Tables 2 and 3). Puerto Rico experienced a substantial decline in teen and young adult employment relative to synthetic control, with employment in this group being, on average, 30.3% lower in Puerto Rico following the phase-in of the minimum wage (Figure 5). In addition, Abadie's placebo test indicates high levels of significance, with results being significant at the 1% level following the completion of the minimum wage's phase in (Table S1). In addition, a placebo treatment date of 2000 for Puerto Rico yields treatment effects that are small and statistically insignificant; this is exactly what should be expected if the decline was related to the minimum wage increase (Table S2). By dividing the estimated treatment effect on the log/employment population ratio,  $-0.303$ , by the percent increase in the minimum wage,  $0.4$ , we can find the elasticity of teen/young adult employment to the minimum wage implied by these results to be  $-0.74$ .

A next step is to compare the treatment effects found for teens to those found for all workers aged 15 and older. If the decrease in employment relative to synthetic control for teens was due to the minimum wage increase, and not a local shock, we should expect smaller effects following the increase for all workers, for whom the minimum wage is less likely to bind. Since 35% of all Puerto Ricans earned \$7.25/h or less in 2010, compared to 58% of Puerto Ricans aged 15–24, they received a dose of the treatment that was 60% the size of the dose received by teens. With this in mind, we can combine synthetic controls with difference-in-difference-in-differences (DDD) to generate a more accurate elasticity. Results showed that total employment in Puerto Rico was 11.1% lower than synthetic control following the minimum wage increase, with p-values ranging from 0.04 to 0.20, with treatment effects increasing in magnitude and significance as the minimum wage was phased in (Table S3). To find the elasticity implied by this triple differences approach, we compute:

$$\varepsilon = \frac{(-0.303) - (-0.111)}{0.4 - \frac{0.35}{0.58}(0.4)} = \frac{-0.192}{0.16} = -1.2.$$

The elasticity implied by the triple differences approach is  $-1.2$ , again substantially larger in magnitude than estimates from the mainland United States.

### 5.1.1 Limited Donor Pool

One alternative approach is to address concerns regarding the potential donor pool countries, given that Norway in particular seems an inappropriate control *ex ante*, by limiting the pool of donor countries to only those which are *a priori* sensible. In order to maintain a stock of placebo countries that is as large as possible, the donor pool was limited by dropping only inappropriate nations chosen by the synthetic control algorithm until the chosen donors for synthetic Puerto Rico had intuitive appeal. After dropping several western European countries, the synthetic control procedure placed high weights on the tropical island nations of Barbados and Comoros, with the remaining weight coming from Sri Lanka and the mainland United States (Tables 4 and 5). The limited donor pool reduced the size of the treatment effect, from an average of 30% to 16%, implying an elasticity of  $-0.4$ . Statistical significance varies, with evidence of a disemployment effect being strongest in the years following the completion of the phase-in of the minimum wage ( $p = 0.04$ ) (Table S4). Finally, we can apply the triple differences approach to the limited donor pool by estimating treatment effects on total employment in Puerto Rico with a limited donor pool and subtracting. Total employment in Puerto Rico was 9.1% lower than the limited donor pool synthetic control following the phase-in of the minimum wage (Table S5). Adjusting for the

**Table 4** Weights for Constructing Synthetic Puerto Rico (Limited Donor Pool)

| Country       | Weight |
|---------------|--------|
| Barbados      | 0.48   |
| Comoros       | 0.422  |
| Sri Lanka     | 0.083  |
| United States | 0.015  |

**Table 5** Indicators in Puerto Rico vs. Synthetic Puerto Rico (Limited Donor Pool)

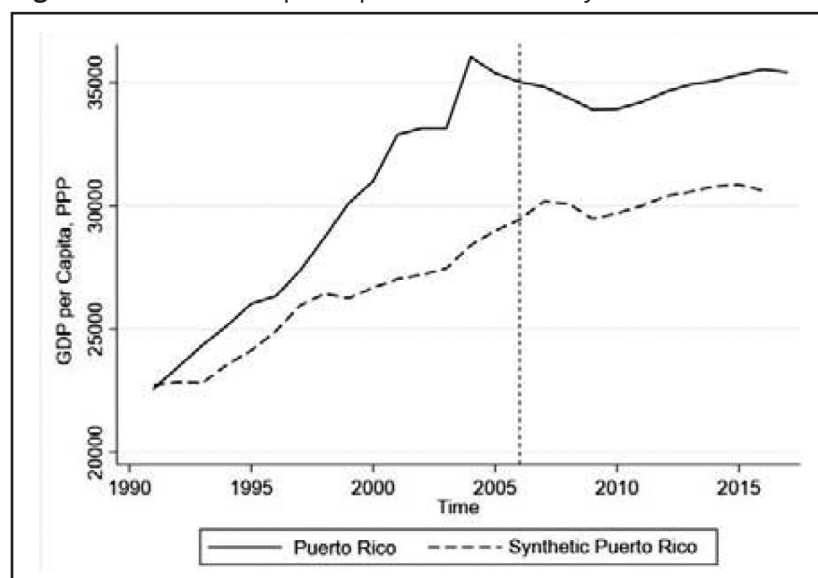
| Indicator   | Puerto Rico | Synthetic Puerto Rico |
|---|-------------|-----------------------|
| GDP Growth  | 3.39        | 2.15                  |
| GDP per capita  | 29,417.35   | 9,061.07              |
| Male Teen Population  | 8.98        | 9.41                  |
| Female Teen Population  | 8.12        | 8.96                  |
| Male Young Adult Population   | 8.23        | 8.68                  |
| Female Young Adult Population   | 7.71        | 8.31                  |
| $\ln\left(\frac{\text{Employment}}{\text{Population}}\right)$ in 1991 | 3.36        | 3.37                  |
| $\ln\left(\frac{\text{Employment}}{\text{Population}}\right)$ in 1995 | 3.39        | 3.41                  |
| $\ln\left(\frac{\text{Employment}}{\text{Population}}\right)$ in 2000 | 3.49        | 3.43                  |
| $\ln\left(\frac{\text{Employment}}{\text{Population}}\right)$ in 2005 | 3.33        | 3.37                  |

differential bite of the minimum wage across these two groups as above yields an elasticity

$$\text{of } \varepsilon = \frac{(-0.16) - (-0.091)}{0.4 - \frac{0.35}{0.58}(0.4)} = \frac{-0.069}{0.16} = -0.43.$$

### 5.1.1 GDP Matching

A threat to identification using the synthetic control method occurs when the treated unit experiences a unique shock at the same time as treatment. Since the phase-in of the new minimum wage coincided with the Great Recession of the late 2000s, it's possible that we are confusing the effects of the recession for the effects of the minimum wage increase. To test for this possibility, we can compare the path of GDP per capita in Puerto Rico to the synthetic Puerto Rico detailed in Table 2. When the two are compared in Figure 6, Puerto Rico's GDP grows faster than synthetic Puerto Rico's during the pre-treatment period, while the two are mostly parallel during the post-treatment period. It's unclear from this examination alone whether or not the Great Recession is confounding the previous results.

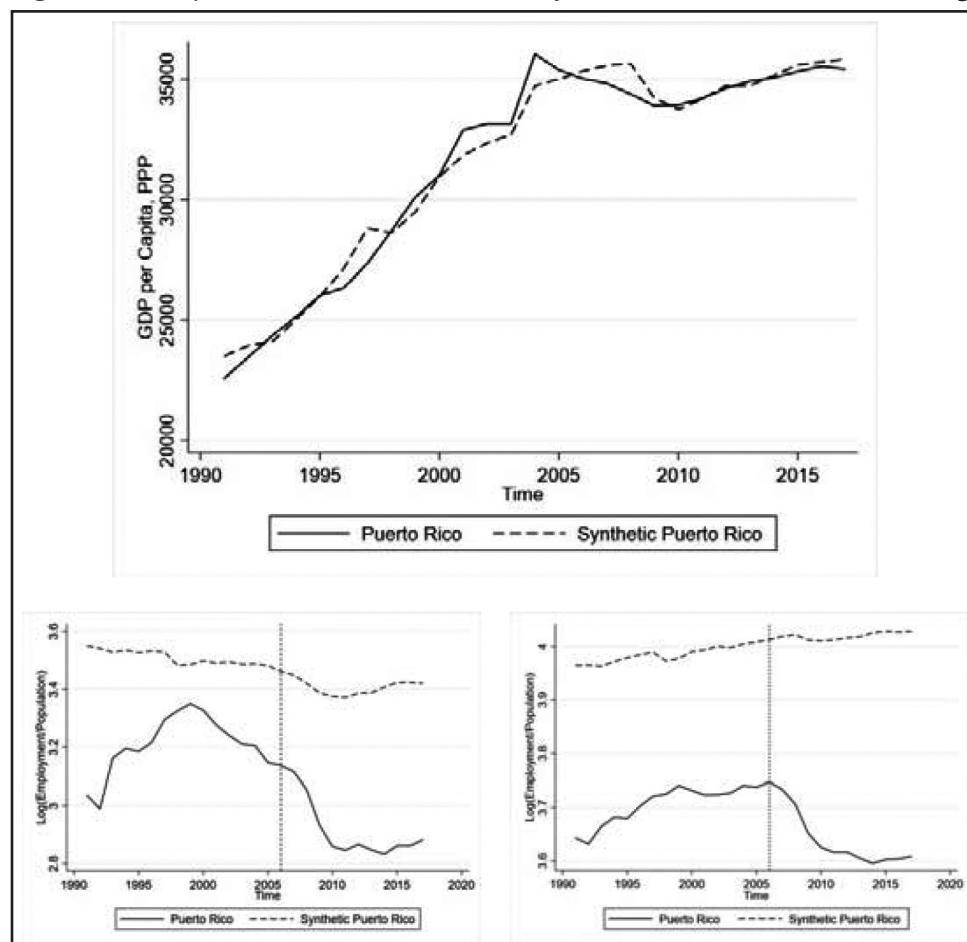
**Figure 6** Path of GDP per Capita in Actual and Synthetic Puerto Rico.

**Table 6** Weights for Constructing Synthetic Puerto Rico (GDP Matching)

| Country              | Weight |
|----------------------|--------|
| United Arab Emirates | 0.112  |
| Equatorial Guinea    | 0.149  |
| Ireland              | 0.046  |
| Iraq                 | 0.085  |
| South Korea          | 0.312  |
| Lebanon              | 0.190  |
| Norway               | 0.106  |

To try to account for the confounding effect of the Great Recession, we can change our strategy in creating synthetic controls. Instead of aiming to minimize the pre-treatment RMSE of employment, I create a synthetic Puerto Rico that minimizes the RMSE of GDP per capita throughout the entire sample period, pre- and post-treatment. This creates a counterfactual Puerto Rico that comes as close as possible to experiencing the same macroeconomic fluctuations as actual Puerto Rico (Table 6). Then, we can compare the path of employment in this new synthetic Puerto Rico to employment on the actual island.

As seen in Figure 7a and Table S6, output in the GDP matched synthetic Puerto Rico closely follows that of the actual island. When comparing trends in employment in Figure 7b,

**Figure 7** Comparisons Between Actual and Synthetic Puerto Rico (GDP Matching).

Source: (A) Path of GDP. (B) Path of Teen/Young Adult Employment. (C) Path of Total Employment.

teen/young adult employment in the GDP matched synthetic Puerto Rico is substantially higher than in actual Puerto Rico in both the pre-treatment and post-treatment periods. Thus, rather than calculating the treatment effect by taking the difference between synthetic and actual Puerto Rico in the post-treatment period, it's more appropriate in this case to compute a simple difference-in-differences estimator using the following linear regression model:

$$\ln\left(\frac{\text{employment}}{\text{population}_{it}}\right) = \beta_0 = \beta_1(\text{did}_{it}) + \beta_2(\text{post}_t) + \beta_3(\text{pri}_i) + \varepsilon_i$$

where  $\text{pri}_i = 1$  for the real Puerto Rico and 0 for synthetic Puerto Rico,  $\text{post}_t = 1$  in years 2007 and later, and  $\text{did}_{it} = \text{pri}_i * \text{post}_t$ . The estimated treatment effect,  $\beta_1$ , was  $-0.196$ , with a standard error of 0.03. Thus, the implied elasticity of teen/young adult employment to the minimum wage is  $\frac{-0.196}{0.4} = -0.49$ .

The GDP matching approach can also be used to estimate the effect on total employment, as seen in Figure 7C. Using the same difference-in-differences estimator from above yields an estimated treatment effect  $\beta_1$  for all adults of 0.108, with a standard error of 0.01. The implied elasticity of total employment to the minimum wage from this approach is  $\frac{-0.108}{0.4} = -0.27$ , and the implied triple differences elasticity is  $\varepsilon = \frac{(-0.196) - (-0.088)}{0.4 - \frac{0.35}{0.58}(0.4)} = \frac{-0.088}{0.16} = -0.55$ .

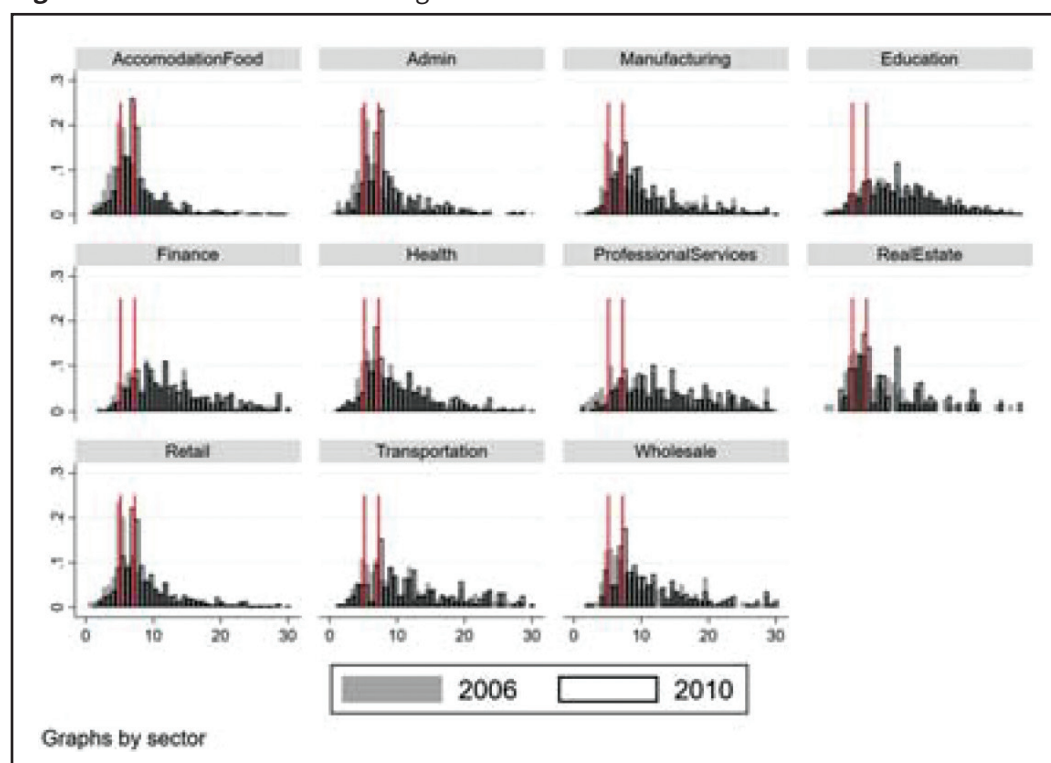
## 6 Food Industry

### 6.1 Cross-Industry Comparisons

Recalling Krueger's finding that the weakest evidence for a disemployment effect of the minimum wage in Puerto Rico came from cross-industry comparisons, any exploration of the minimum wage's effect on Puerto Rico should utilize a similar technique. Additionally, since this approach only uses Puerto Rican industries as donors, there is less concern about Puerto Rican specific shocks contaminating the results. Using data from the Bureau of Labor Statistics' State and Area Employment Hours and Earnings program, my initial approach is to construct a synthetic control for the accommodation and food industry using all other island industries where the minimum wage is less likely to bind as donors (Figure 8).

The synthetic control algorithm constructed the synthetic accommodation and food industry using the health, retail, education, and professional services industries (Tables 7 and 8). Comparing the accommodation and food industry to its synthetic counterpart shows total employment was, on average, 8.5% lower after that minimum wage was phased in (Figure 9). Unlike with results for teens, raw placebo p-values for the cross-industry synthetic controls generally failed to reach statistical significance ( $0.07 < p < 0.31$ ). However, these results become significant or approach significance for all periods if the p-values are adjusted for the quality of the per-treatment t (Table S7). In addition, a placebo date test using Q4 2000 as the treatment date yielded treatment effects that were small and statistically insignificant (Table S8).

To find the elasticity of accommodation and food industry employment to the minimum wage, we first need to find the coverage of the minimum wage in the constructed synthetic accommodation and food industry. By summing the products of each industry's share of the synthetic control and the share of workers earning \$7.25/hour or below in each industry, we can find that the synthetic accommodation and food industry had an effective coverage

**Figure 8** Bite of the Minimum Wage Across Puerto Rican Industries.**Table 7** Weights for Constructing Synthetic Accommodation and Food Industry (Puerto Rican Industry Donors)

| Industry              | Weight |
|-----------------------|--------|
| Education             | 0.06   |
| Health                | 0.587  |
| Professional Services | 0.187  |
| Retail                | 0.22   |

**Table 8** Pre-Treatment Log Employment in Actual and Synthetic Accommodation and Food Industry (Puerto Rican Industry Donors)

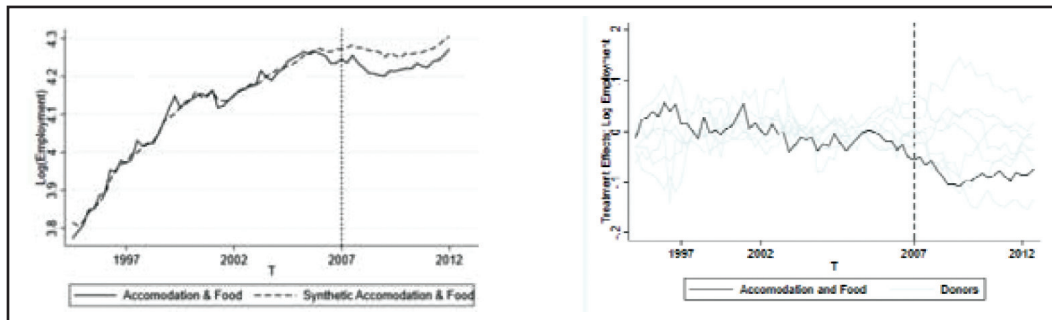
| Period  | Accommodation & Food | Synthetic Accommodation & Food |
|---------|----------------------|--------------------------------|
| Q1 1995 | 3.772761             | 3.814832                       |
| Q3 1997 | 3.972177             | 3.97396                        |
| Q1 2000 | 4.11741              | 4.117964                       |
| Q3 2002 | 4.149464             | 4.150361                       |
| Q1 2005 | 4.239887             | 4.227708                       |

of 47%, compared to the actual accommodation and food industry's 69%. The elasticity of accommodation and food employment to the minimum wage implied by this approach is thus

$$\varepsilon = \frac{-0.085}{0.4 - \frac{0.47}{0.69}(0.4)} = -0.66.$$



**Figure 9** Treatment Effects and Placebo Test: Accommodation and Food Industry (Island Industry Donors).



Source: (A) Actual vs. Synthetic Control (B) Placebo Test (Donors with  $>2 \times \text{PRI}$  Pre Treatment RMSE Dropped).

## 6.2 Cross-City Comparisons

One additional strategy to identify the employment effect for bound industries is to construct a synthetic control for the accommodation and food industry in the San Juan metropolitan statistical area (MSA) using the same industry in MSAs on the mainland U.S. as donors. With this in mind, data on employment in the accommodation and food industry for San Juan and 99 other MSAs was obtained and combined with data from the 2000 census to construct the employment/population ratio for each MSA. The synthetic control procedure identified Visalia-Porterville, CA, Trenton, NJ, and Norwich-New London-Westerly, CT-RI as donors to construct San Jaun's synthetic accommodation and food industry (Tables 9 and 10). The employment/population ratio in San Juan's accommodation and food industry was found

**Table 9** Weights for Constructing Synthetic Accommodation and Food Industry (USA Donors)

| MSA                         | Weight |
|-----------------------------|--------|
| Visalia-Porterville, CA     | 0.665  |
| Trenton, NJ                 | 0.264  |
| Norwich-New London-Westerly | 0.071  |

MSA, metropolitan statistical area.

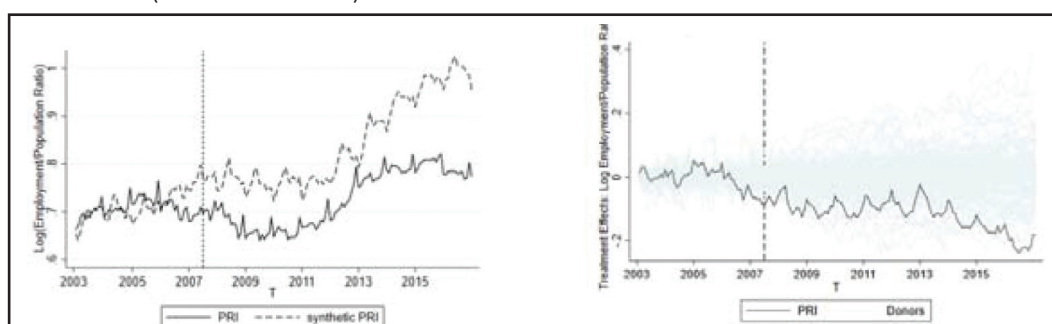
**Table 10** Pre-Treatment Log Employment/Population Ratio in Actual and Synthetic Accommodation and Food Industry (USA Donors)

| Period   | Accommodation and Food | Synthetic Accommodation and Food |
|----------|------------------------|----------------------------------|
| Jan 2003 | 0.663                  | 0.654                            |
| Jun 2003 | 0.692                  | 0.707                            |
| Jan 2004 | 0.732                  | 0.711                            |
| Jun 2004 | 0.708                  | 0.735                            |
| Jan 2005 | 0.749                  | 0.696                            |
| Jun 2005 | 0.738                  | 0.735                            |
| Jan 2006 | 0.765                  | 0.723                            |
| Jun 2006 | 0.723                  | 0.750                            |
| Jan 2007 | 0.710                  | 0.756                            |
| Jun 2007 | 0.710                  | 0.798                            |

to be 9% lower than synthetic control on average following the phase-in of the minimum wage (Figure 10). Fortunately, none of the three MSAs chosen as donors were bound by the minimum wage increase, so the implied elasticity is  $\varepsilon = \frac{-0.09}{0.4} = -0.23$ . The effects vary in their significance ( $0.02 < p < 0.37$ ) depending on the post-treatment period ( $0.01 < p < 0.93$ ) (Table S10), but this variance in significance may partially be the result of the fact that the data was not available with seasonal adjustments (Table S9).

As an alternative, a synthetic Accommodation and Food industry using US MSAs was constructed using log employment, rather than the log employment/population ratio as the dependent variable of interest. In this case, the synthetic control procedure selected Miami FL, Tampa FL, Trenton NJ, and Tucson AZ as the donor cities comprising the synthetic San Juan restaurant industry (Tables 11 and 12). This specification also yielded a better pre-treatment

**Figure 10** Treatment Effects and Placebo Test: Accommodation and Food Industry (USA MSA Donors).



Source: (A) Actual vs. Synthetic Control (B) Placebo Test (Donors with  $>2 \times$  PRI Pre Treatment RMSE Dropped). MSA, metropolitan statistical area; RMSE, root mean squared error.

**Table 11** Weights for Constructing Synthetic Accommodation and Food Industry (USA Donors)

| MSA                      | Weight | A&F MW Coverage (%) |
|--------------------------|--------|---------------------|
| Trenton, NJ              | 0.443  | 0                   |
| Tampa-St. Petersburg, FL | 0.106  | 37                  |
| Miami-Ft. Lauderdale, FL | 0.444  | 32                  |
| Tucson, AZ               | 0.007  | 43                  |

**Table 12** Pre-Treatment Log Employment in Actual and Synthetic Accommodation and Food Industry (USA Donors)

| Period   | Accommodation and Food | Synthetic Accommodation and Food |
|----------|------------------------|----------------------------------|
| Jan 2003 | 3.91                   | 3.91                             |
| Jun 2003 | 3.94                   | 3.94                             |
| Jan 2004 | 3.98                   | 3.97                             |
| Jun 2004 | 3.96                   | 3.98                             |
| Jan 2005 | 4.00                   | 4.00                             |
| Jun 2005 | 4.01                   | 3.99                             |
| Jan 2006 | 3.97                   | 3.98                             |
| Jun 2006 | 3.97                   | 3.98                             |
| Jan 2007 | 3.96                   | 3.96                             |
| Jun 2007 | 3.96                   | 3.98                             |

t than the previous synthetic control using the employment population ratio, without the concerning divergence between actual and synthetic employment observed in late 2006 prior to the wage increase that was previously observed. On average, employment in the San Juan restaurant industry was 4% lower than its synthetic counterpart, with effects also varying in significance depending on the post-treatment period ( $0.01 < p < 0.93$ ) (Table 10). Unlike the specification detailed in Table 9, some of the donor cities used to construct the synthetic San Juan restaurant industry were bound by the minimum wage increase. Using the values in Table 11, multiplying each donor city's coverage by its weight given by the synthetic control algorithm yields a synthetic minimum wage coverage of 18%, so the elasticity of employment to the minimum wage implied by this approach is  $\varepsilon = \frac{-0.041}{0.4 - \frac{0.18}{0.69}(0.4)} = -0.14$ .

## Part VI

### 7 Discussion

Estimates of the elasticity of teen/young adult employment to the minimum wage in Puerto Rico, summarized in Table 13, vary in magnitude and significance, but remain negative and at least modest in size. The average of all elasticities is  $-0.47$ , nearly equal to Castillo-Freeman's estimate of  $-0.41$ . Estimates of elasticity of accommodation and food employment to the minimum wage differ by method, with cross-industry comparisons yielding a higher elasticity than using US cities as donors. For comparison, Wolfson and Belman (2019) report the consensus range in the literature for the elasticity of teen employment to the minimum wage in the United States

**Table 13** Estimated Own-Wage Elasticities of Employment

| Model | Group              | Method             | Dependent Variable                                 | MW Elasticity | MW Coverage | Own-Wage Elasticity |
|-------|--------------------|--------------------|--|---------------|-------------|---------------------|
| (1)   | Ages 15–24         | Synthetic Control  | $\ln(\frac{\text{employment}}{\text{population}})$ | –0.74         | 76%         | –0.97               |
| (2)   | Ages 15–24         | Triple Differences | $\ln(\frac{\text{employment}}{\text{population}})$ | –1.26         | 76%         | –1.65               |
| (3)   | Ages 15–24         | Limited Donors     | $\ln(\frac{\text{employment}}{\text{population}})$ | –0.39         | 76%         | –0.51               |
| (4)   | Ages 15–24         | (2) & (3)          | $\ln(\frac{\text{employment}}{\text{population}})$ | –0.43         | 76%         | –0.56               |
| (5)   | Ages 15–24         | GDP Matching       | $\ln(\frac{\text{employment}}{\text{population}})$ | –0.49         | 76%         | –0.65               |
| (6)   | Ages 15–24         | (2) & (5)          | $\ln(\frac{\text{employment}}{\text{population}})$ | –0.55         | 76%         | –0.72               |
| (7)   | All Workers        | Synthetic Control  | $\ln(\frac{\text{employment}}{\text{population}})$ | –0.28         | 46%         | –0.60               |
| (8)   | All Workers        | Limited Donors     | $\ln(\frac{\text{employment}}{\text{population}})$ | –0.22         | 46%         | –0.49               |
| (9)   | All Workers        | GDP Matching       | $\ln(\frac{\text{employment}}{\text{population}})$ | –0.27         | 46%         | –0.59               |
| (10)  | Restaurant Workers | Cross Industry     | $\ln(\text{employment})$                           | –0.66         | 69%         | –0.95               |
| (11)  | Restaurant Workers | USA MSA Donors     | $\ln(\frac{\text{employment}}{\text{population}})$ | –0.23         | 65%         | –0.35               |
| (12)  | Restaurant Workers | USA MSA Donors     | $\ln(\text{employment})$                           | –0.14         | 65%         | –0.22               |

to be  $-0.13$  to  $-0.07$ . Harasztosi and Lindner (2019) report that 25% of teens in 2012 were directly affected by the minimum wage, so the consensus range of own-wage elasticities is  $-0.28$  to  $-0.52$  for the continental United States. Across all groups, the average own-wage elasticity of employment was  $-0.68$ , ranging from  $-0.22$  to  $-1.65$ . The increase in the Federal Minimum wage from \$5.15 to \$7.25 appears to have depressed employment among affected workers in Puerto Rico to a greater degree than among affected workers in the continental United States.

There are multiple theoretical reasons why the elasticity of employment to the minimum wage may decrease at higher relative minimum wages. As Clemens (2021) discusses, cuts in employment are only one way in which employers may respond to an increase in the minimum wage, but these alternative margins of adjustment dry up as the relative minimum wage grows higher. For example, while most of the literature on the employment effects of the minimum wage focuses on the extensive margin of employment, hiring and firing, there is emerging evidence that RMS in the United States adjust along the intensive margin by cutting the number of hours each employee works. Jardim et al. (2017) found that the minimum wage led to a reduction of hours worked in Seattle, while also estimating a null effect on restaurant employment. Horton (2017) also found that randomly imposed minimum wages lead to a large reduction in hours worked in an online labor market. An alternative response to cutting hours is to reduce non-cash fringe benefits accorded to workers such as health insurance or paid leave, a response documented by Clemens et al. (2018). Since only 23.6% of Puerto Ricans receive employer-funded health insurance, compared to 49.6% of Americans in general (U.S. Census Bureau, 2019), employers in Puerto Rico were already less flexible in their ability to cut fringe benefits compared to employers in the United States. As the relative minimum wage climbs higher these alternative margins of adjustment become less capable of absorbing employers' higher labor costs. Hours and fringe benefits can only go so low before employers are faced with the choice of either cutting back employment or shutting down entirely. Another mechanism by which the sensitivity of employment to the minimum wage increases at higher relative minimum wages has to do with the differential employment response across sectors of the economy. Research from Cengiz et al. (2019) and Gopalan et al. (2021) suggests that the employment response is significantly stronger in the tradable sector of the economy relative to the non-tradable sector. This heterogeneous response is likely due to higher product demand elasticity for the tradable sector limiting the ability of tradable RMS to defray costs by raising output prices. In the mainland United States, the vast majority of workers bound by the minimum wage increase were concentrated in the non-tradable sector, where average wages are lower. In Puerto Rico, however, a quarter of manufacturing workers in 2010 earned \$7.25/h or less (Table 2), indicating that a greater share of affected workers in Puerto Rico belonged to the tradable sector where prices are less able to absorb the higher wage floor.

## Part VII

### 8 Conclusion

This paper contributes to the extensive literature on the employment effects of minimum wages by focusing on the 2007 increase in Puerto Rico's minimum wage, which led to a relative minimum wage for the island nation that was significantly higher than any found in the continental United States and thus affected the wages of a greater number of workers. Results indicate that

employment in Puerto Rico fell relative to a data-constructed synthetic counterfactual following the phase-in of the higher minimum wage. Furthermore, employment for more affected subgroups like teens and restaurant workers fell more sharply proportional to their higher minimum wage coverage (Table S11). Estimated elasticities of employment to the minimum wage for groups in Puerto Rico were higher than those found from studies of the mainland US, but elasticities of employment to the own wage were also larger than consensus estimates from the mainland. This may be due to the fact that RMS are less able to adjust along non-employment margins such as hours or fringe benefits at higher relative minimum wages, and that higher relative minimum wages are more likely to bind in the tradable sector of the economy where output prices are less flexible. There still exist limitations to this particular strategy for estimating the effect of the minimum wage on employment in Puerto Rico. Limited availability of hourly wage data makes it difficult to assess the direct effect of the minimum wage on workers' incomes, and my analysis doesn't investigate alternative margins for adjustment such as output price increases, reductions in hours, or cuts to non-wage benefits.

The largest limitation of my analysis is my inability to completely rule out the effect of confounding shocks to Puerto Rico's labor market which coincided with the minimum wage increase. For example, between 1996 and 2006, Congress gradually phased out various tax incentives, most notably the possession tax credit under US Code Section 936, conferred to Puerto Rican companies, increasing the tax burden for many Puerto Rican RMS. While this phase-out occurred during the pre-treatment period, it's possible that its effects weren't fully felt until after the minimum wage increase in 2007. Similarly, as discussed in Part V, Section 1.3, cross country comparisons may fail to isolate the effect of the minimum wage increase from the effects of the Great Recession which hit Puerto Rico especially hard. However, several components of my analysis serve to control for Puerto Rican specific-shocks and still indicate a negative employment effect of the minimum wage. First, some of the comparisons in Part V, Section 2.1 exploit variation in the bite of the minimum wage across Puerto Rican industries, which would all be affected by Puerto Rican specific macroeconomic shocks. Secondly, in the results using international comparisons in Part V, Section 1, I find that the estimated treatment effect of the minimum wage was smaller for all workers than for teenage workers with higher levels of exposure to the minimum. The estimated employment elasticity from the triple differences approach was actually larger than the one obtained through international comparisons alone, which is the opposite of what would be expected if an island specific shock was biasing the results. Finally, even when I create a synthetic Puerto Rico matching entirely on fluctuations in pre- and post-treatment output and growth, which assumes that the minimum wage increase had no effect on GDP levels or growth, I still find evidence of declines in employment.

#### **Declarations**

##### **Availability of Data and Material**

All data used is available through the Bureau of Labor Statistics, the Census Bureau, IPUMS, and the World Bank.

##### **Competing Interests**

The author certifies that he has no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

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### Authors' Contributions

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## Part VIII

### Supplementary Tables

**Table S1** Treatment Effects and Significance for Log Teen Employment/Population Ratio in Puerto Rico

| Period | Estimated Effect | P-Value | Adjusted P-Value |
|--------|------------------|---------|------------------|
| 2007   | −0.065           | 0.221   | 0.662            |
| 2008   | −0.082           | 0.205   | 0.610            |
| 2009   | −0.137           | 0.103   | 0.558            |
| 2010   | −0.238           | 0.036   | 0.426            |
| 2011   | −0.350           | 0.010   | 0.338            |
| 2012   | −0.341           | 0.010   | 0.359            |
| 2013   | −0.349           | 0.041   | 0.354            |
| 2014   | −0.343           | 0.052   | 0.374            |
| 2015   | −0.339           | 0.067   | 0.400            |
| 2016   | −0.314           | 0.098   | 0.436            |
| 2017   | −0.300           | 0.103   | 0.477            |

**Table S2** Treatment Effects and Significance for Log Teen Employment/Population Ratio in Puerto Rico (Placebo Treatment Date of 2000)

| Period | Estimated Effect | P-Value | Adjusted P-Value |
|--------|------------------|---------|------------------|
| 2001   | −0.031           | 0.323   | 0.810            |
| 2002   | −0.046           | 0.379   | 0.795            |
| 2003   | −0.047           | 0.467   | 0.851            |
| 2004   | −0.061           | 0.354   | 0.800            |
| 2005   | −0.081           | 0.338   | 0.784            |
| 2006   | −0.152           | 0.107   | 0.677            |

**Table S3** Treatment Effects and Significance for Log Total Employment/Population in Puerto Rico

| Period | Estimated Effect | P-Value | Adjusted P-Value |
|--------|------------------|---------|------------------|
| 2007   | −0.043           | 0.312   | 0.451            |
| 2008   | −0.063           | 0.179   | 0.410            |
| 2009   | −0.114           | 0.046   | 0.267            |
| 2010   | −0.132           | 0.041   | 0.282            |
| 2011   | −0.124           | 0.046   | 0.312            |
| 2012   | −0.108           | 0.097   | 0.369            |
| 2013   | −0.101           | 0.138   | 0.431            |
| 2014   | −0.119           | 0.102   | 0.364            |
| 2015   | −0.111           | 0.144   | 0.405            |
| 2016   | −0.097           | 0.201   | 0.451            |
| 2017   | −0.097           | 0.200   | 0.451            |



**Table S4** Treatment Effects and Significance for Log Teen Employment/Population Ratio in Puerto Rico (Limited Donor Pool)

| Period | Estimated Effect | P-Value | Adjusted P-Value |
|--------|------------------|---------|------------------|
| 2007   | −0.058           | 0.244   | 0.694            |
| 2008   | −0.101           | 0.178   | 0.644            |
| 2009   | −0.171           | 0.111   | 0.550            |
| 2010   | −0.217           | 0.078   | 0.527            |
| 2011   | −0.263           | 0.044   | 0.439            |
| 2012   | −0.169           | 0.138   | 0.605            |
| 2013   | −0.190           | 0.122   | 0.594            |
| 2014   | −0.153           | 0.222   | 0.617            |
| 2015   | −0.101           | 0.389   | 0.783            |
| 2016   | −0.117           | 0.316   | 0.750            |
| 2017   | −0.048           | 0.656   | 0.894            |

**Table S5** Treatment Effects and Significance for Log Total Employment/Population Ratio in Puerto Rico (Limited Donor Pool)

| Period | Estimated Effect | P-Value | Adjusted P-Value |
|--------|------------------|---------|------------------|
| 2007   | −0.037           | 0.294   | 0.567            |
| 2008   | −0.059           | 0.239   | 0.478            |
| 2009   | −0.097           | 0.133   | 0.378            |
| 2010   | −0.113           | 0.106   | 0.367            |
| 2011   | −0.106           | 0.128   | 0.439            |
| 2012   | −0.084           | 0.183   | 0.500            |
| 2013   | −0.075           | 0.250   | 0.561            |
| 2014   | −0.092           | 0.206   | 0.494            |
| 2015   | −0.087           | 0.217   | 0.522            |
| 2016   | −0.083           | 0.239   | 0.511            |
| 2017   | −0.089           | 0.228   | 0.522            |

**Table S6** Indicators in Puerto Rico vs. Synthetic Puerto Rico (GDP Matching)

| Indicator              | Puerto Rico | Synthetic Puerto Rico |
|------------------------|-------------|-----------------------|
| GDP per capita in 1991 | 22579.09    | 23501.23              |
| GDP per capita in 1995 | 26027.23    | 25976.47              |
| GDP per capita in 2000 | 31005.18    | 30950.21              |
| GDP per capita in 2003 | 33147.79    | 32690.81              |
| GDP per capita in 2005 | 35375.3     | 35005.24              |
| GDP per capita in 2007 | 34820.77    | 35557.17              |
| GDP per capita in 2009 | 33892.85    | 34206.46              |
| GDP per capita in 2010 | 33924.06    | 33746.06              |
| GDP per capita in 2011 | 34195.65    | 34173.33              |
| GDP per capita in 2013 | 34913.63    | 34731.05              |
| GDP per capita in 2015 | 35314.43    | 35581.21              |
| GDP per capita in 2017 | 35403.01    | 35840.44              |

**Table S7** Treatment Effects and Significance for Log Employment in Puerto Rican Accommodation and Food Industry (Puerto Rican Industry Donors)

| Period  | Estimated Effect | P-Value (One Sided) | Adjusted P-Value |
|---------|------------------|---------------------|------------------|
| Q4 2007 | −0.0502          | 0.214               | 0                |
| Q1 2008 | −0.0673          | 0.071               | 0                |
| Q2 2008 | −0.0590          | 0.214               | 0.071            |
| Q3 2008 | −0.0764          | 0.071               | 0                |
| Q4 2008 | −0.0887          | 0                   | 0                |
| Q1 2009 | −0.1049          | 0.071               | 0                |
| Q2 2009 | −0.1044          | 0.142               | 0                |
| Q3 2009 | −0.1081          | 0.214               | 0                |
| Q4 2009 | −0.0998          | 0.285               | 0.071            |
| Q1 2010 | −0.0906          | 0.214               | 0.142            |
| Q2 2010 | −0.0829          | 0.285               | 0.142            |
| Q3 2010 | −0.0916          | 0.214               | 0.071            |
| Q4 2010 | −0.0879          | 0.214               | 0.071            |
| Q1 2011 | −0.0775          | 0.214               | 0.071            |
| Q2 2011 | −0.0901          | 0.285               | 0.071            |
| Q3 2011 | −0.0972          | 0.214               | 0.071            |
| Q4 2011 | −0.0806          | 0.357               | 0.071            |
| Q1 2012 | −0.0868          | 0.214               | 0.071            |
| Q2 2012 | −0.0851          | 0.285               | 0.071            |
| Q3 2012 | −0.0751          | 0.285               | 0.071            |

**Table S8** Treatment Effects and Significance for Log Employment in Puerto Rican Accommodation and Food Industry (Placebo Treatment Date of Q4 2000)

| Period  | Estimated Effect | P-Values (One Sided) | Adjusted P-Values |
|---------|------------------|----------------------|-------------------|
| Q1 2001 | −0.0111          | 0.285                | 0.642             |
| Q2 2001 | 0.0079           | 0.642                | 0.714             |
| Q3 2001 | −0.0103          | 0.214                | 0.642             |
| Q4 2001 | −0.0183          | 0.214                | 0.571             |
| Q1 2002 | −0.0491          | 0.214                | 0.142             |
| Q2 2002 | −0.0567          | 0.357                | 0.214             |
| Q3 2003 | −0.0352          | 0.357                | 0.428             |
| Q4 2003 | −0.0437          | 0.428                | 0.357             |
| Q1 2004 | −0.0356          | 0.428                | 0.428             |
| Q2 2004 | −0.0439          | 0.428                | 0.428             |
| Q3 2004 | −0.0417          | 0.357                | 0.571             |
| Q4 2004 | −0.0524          | 0.428                | 0.357             |
| Q1 2005 | −0.0304          | 0.357                | 0.571             |
| Q2 2005 | −0.0450          | 0.285                | 0.428             |
| Q3 2005 | −0.0649          | 0.428                | 0.285             |
| Q4 2005 | −0.0413          | 0.357                | 0.500             |
| Q1 2006 | −0.0337          | 0.357                | 0.571             |
| Q2 2006 | −0.0218          | 0.357                | 0.714             |
| Q3 2006 | −0.0117          | 0.357                | 0.857             |
| Q4 2006 | −0.0064          | 0.5                  | 0.857             |
| Q1 2007 | −0.0120          | 0.357                | 0.785             |

**Table S9** Treatment Effects and Significance for Log Employment/Population Ratio in Puerto Rican Accommodation and Food Industry (USA Donors) (Truncated to Quarterly for Space)

| Period | Estimated Effect | P-Value (One-Sided) | Adjusted P-Value |
|--------|------------------|---------------------|------------------|
| Jul-07 | −0.0754          | 0.049               | 0.0693           |
| Oct-07 | −0.0892          | 0.049               | 0.049            |
| Jan-08 | −0.0417          | 0.2376              | 0.5445           |
| Apr-08 | −0.0830          | 0.0693              | 0.2277           |
| Jul-08 | −0.1050          | 0.039               | 0.2079           |
| Oct-08 | −0.1256          | 0.029               | 0.1485           |
| Jan-09 | −0.0863          | 0.1089              | 0.3960           |
| Apr-09 | −0.1110          | 0.0990              | 0.3168           |
| Jul-09 | −0.1180          | 0.1089              | 0.2277           |
| Oct-09 | −0.0911          | 0.1386              | 0.3069           |
| Jan-10 | −0.0760          | 0.1782              | 0.4158           |
| Apr-10 | −0.1021          | 0.1485              | 0.3663           |
| Jul-10 | −0.1276          | 0.0792              | 0.2277           |
| Oct-10 | −0.1220          | 0.0891              | 0.3267           |
| Jan-11 | −0.0579          | 0.3267              | 0.6336           |
| Apr-11 | −0.0918          | 0.1782              | 0.4851           |
| Jul-11 | −0.1058          | 0.1584              | 0.4158           |
| Oct-11 | −0.0780          | 0.2277              | 0.5841           |
| Jan-12 | −0.0749          | 0.2475              | 0.6336           |
| Apr-12 | −0.098           | 0.1683              | 0.5049           |
| Jul-12 | −0.1172          | 0.1287              | 0.3861           |
| Oct-12 | −0.0727          | 0.2772              | 0.6336           |
| Jan-13 | −0.0416          | 0.5544              | 0.7425           |
| Apr-13 | −0.0919          | 0.1881              | 0.5049           |
| Jul-13 | −0.1155          | 0.1386              | 0.3762           |
| Oct-13 | −0.1157          | 0.1584              | 0.4059           |
| Jan-14 | −0.0829          | 0.2574              | 0.4653           |
| Apr-14 | −0.1382          | 0.1386              | 0.3564           |
| Jul-14 | −0.1579          | 0.0891              | 0.3168           |
| Oct-14 | −0.1520          | 0.1188              | 0.3564           |

**Table S10** Treatment Effects and Significance for Log Employment in Puerto Rican Accommodation and Food Industry (USA Donors) (Truncated to Quarterly for Space)

| Period | Estimated Effect | P-Value (One-Sided) | Adjusted P-Value |
|--------|------------------|---------------------|------------------|
| Jul-07 | −0.008           | 0.67                | 0.72             |
| Oct-07 | −0.026           | 0.29                | 0.31             |
| Jan-08 | −0.013           | 0.60                | 0.65             |
| Apr-08 | −0.063           | 0.08                | 0.04             |
| Jul-08 | −0.041           | 0.22                | 0.23             |
| Oct-08 | −0.033           | 0.41                | 0.43             |
| Jan-09 | −0.061           | 0.22                | 0.24             |
| Apr-09 | −0.039           | 0.33                | 0.36             |
| Jul-09 | −0.029           | 0.47                | 0.53             |
| Oct-09 | −0.011           | 0.73                | 0.76             |
| Jan-10 | −0.036           | 0.46                | 0.48             |
| Apr-10 | −0.046           | 0.37                | 0.41             |
| Jul-10 | −0.054           | 0.31                | 0.34             |
| Oct-10 | −0.035           | 0.5                 | 0.54             |
| Jan-11 | −0.051           | 0.39                | 0.41             |
| Apr-11 | −0.040           | 0.54                | 0.58             |
| Jul-11 | −0.026           | 0.69                | 0.75             |
| Oct-11 | −0.005           | 0.93                | 0.94             |
| Jan-12 | −0.046           | 0.51                | 0.54             |
| Apr-12 | −0.042           | 0.50                | 0.54             |
| Jul-12 | −0.026           | 0.68                | 0.71             |
| Oct-12 | 0.016            | 0.83                | 0.87             |
| Jan-13 | −0.027           | 0.73                | 0.79             |
| Apr-13 | −0.031           | 0.61                | 0.63             |
| Jul-13 | −0.03            | 0.62                | 0.65             |
| Oct-13 | −0.008           | 0.88                | 0.91             |
| Jan-14 | −0.051           | 0.50                | 0.5              |
| Apr-14 | −0.061           | 0.39                | 0.38             |
| Jul-14 | −0.054           | 0.43                | 0.48             |
| Oct-14 | −0.072           | 0.38                | 0.36             |

**Table S11** Bite of the Minimum Wage Across Groups

| Group                                     | % Earning 7.25/h or less in 2006 (%) | % Earning 7.25/h or less in 2010 (%) |
|---|--------------------------------------|--------------------------------------|
| All Puerto Ricans                         | 46                                   | 35                                   |
| Puerto Ricans Aged 15–24                  | 76                                   | 58                                   |
| Accommodation and Food Workers            | 69                                   | 55                                   |
| Accommodation and Food Workers (San Juan) | 65                                   | 50                                   |
| Retail Workers                            | 62                                   | 47                                   |
| Education Workers                         | 20                                   | 17                                   |
| Health Workers                            | 43                                   | 37                                   |
| Manufacturing Workers                     | 39                                   | 25                                   |
| Professional Services Workers             | 37                                   | 46                                   |