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First to $15: Alberta's Minimum Wage Policy on Employment by Wages, Ages, and Places

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First to $15: Alberta's Minimum Wage Policy on Employment by Wages, Ages, and Places *

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Abstract

Most minimum wage studies are identified on small, plentiful, and expected wage changes, spread out over time. A recent set of changes have instead been large, unexpected, and quick, following the "Fight for $15" movement. Alberta is the first state or province to have this $15 minimum wage, with an unexpectedly large increase (47%) occurring over a short horizon (3 years). The employment effects of this policy are estimated using a synthetic control approach on Labour Force Survey data. Similar to the existing literature, workers moved up the wage distribution, increment by increment, reaching past the 15th percentile, but not all remained employed. Employment losses were found mostly among younger workers, at magnitudes similar to previous elasticities. Newer to the literature, regional employment losses were found mostly outside of Alberta's two main cities, but youth employment losses were similar between urban and non-urban areas, with an urban older worker offset.

Keywords: employment; Fight for $15; geography; minimum wage; synthetic control.
JEL Codes: J21; J38; J48; J82; R23.

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1 Introduction

Most of the empirical studies that comprise the vast minimum wage literature are identified on small, plentiful, mostly expected minimum wage changes, spread out over time.[1] This is because most of the minimum wage policy changes used for identification have been relatively small in magnitude, resulting from either being increased nominally by step-wise legislation, or by having a formula in place, where minimum wage increases are automatically tied to changes in prices and/or earnings. As such, these small changes are also plentiful and mostly expected over a set period of time, often occurring annually.

In contrast, a relatively recent set of minimum wage changes were large, unexpected, and quick, with most being tied to the concept of a nominal $15 minimum wage, despite historical levels well below that benchmark and significant existing heterogeneity across jurisdictions. The onus for these new types of minimum wage changes originated at the city level in 2012, as the "Fight for 15" movement among fast food workers in New York City. Although it would take those New York City workers an additional six to seven years to reach their goal, this idea quickly spread to other U.S. cities, such as San Francisco, Seattle, and Washington, D.C.[2]

Over time, these large, unexpected, and quick minimum wage changes have also become more plentiful and more expansive in their geographic reach. In our case of interest, Alberta became the first state or province in North America to reach a $15 minimum wage on October 1st, 2018.[3] This path was set in place in 2015, when

[1]The minimum wage literature is so plentiful in studies at present, that even its literature reviews have become numerous (with Brown et al., 1982; Card and Krueger, 1994, 1995; Brown, 1999; Neumark and Wascher, 2007, 2008; Neumark et al., 2014; Allegretto et al., 2017; Neumark and Wascher, 2017; Dube, 2019; and most recently, Neumark and Shirley, 2022).

[2]For a recent review of local level minimum wages in the U.S., see Dube and Lindner (2021).

[3]Due to currency differences, $15 CAD is not exactly equivalent to $15 USD. On October 1st, 2018, $15 CAD was equivalent to around $11.71 USD, based on the daily exchange rate of 0.78043.

Alberta's general minimum wage began its 47 percent increase from $10.20, through four annual increments of $1.00 in 2015, $1.00 in 2016, $1.40 in 2017, and $1.40 in 2018, all happening on October 1st of their respective years. Prior to Alberta's policy, minimum wages of such a nominal level were relegated to only two U.S. cities.

Many provinces, states, and territories have followed Alberta by setting a $15 minimum wage or higher starting several years later, including Nunavut (April 1st, 2020), British Columbia (June 1st, 2021), the Northwest Territories (September 1st, 2021), California (January 1st, 2022), Yukon (April 1st, 2022), and Ontario (October 1st, 2022). At present, the next to follow will be Connecticut, Manitoba, Massachusetts, New York, and Prince Edward Island (2023); Maryland, Newfoundland and Labrador, New Jersey, Nova Scotia, and Saskatchewan (2024); Delaware, Illinois, and Rhode Island (2025); and Florida and Virginia (2026).

And this geographic reach is ever increasing, beyond provinces, states, and territories, to the national level. The U.S. first proposed to raise its federal rate by more than double, from $7.25 to $15.00 by mid-2025, possibly affecting the pay of over 27 million workers, as part of its Raise the Wage Act of 2021 released on January 26, 2021 (Congressional Budget Office, 2021). However, Canada was the first to actually raise its minimum wage to the $15 level for over 26 thousand federal workers on December 29th, 2021, as part of its Budget 2021 (Department of Finance Canada, 2021). The U.S. then closely followed Canada's policy, by enacting a $15 minimum wage for only its federal contractors on March 30th, 2022.

This new type of policy containing large, unexpected, and quick minimum wage increases with an ever expanding geographic reach offer answers to two main research questions. First, do these new types of minimum wage changes offer results that are

However, the value of $15 CAD was slightly higher when the policy was first proposed in April 2015, at $12.15 USD, based on the monthly exchange rate of 0.8102.

similar or different to the existing literature, such as with respect to the elasticities, and how? For example, if the same elasticity is implied, then the small previous minimum wage changes would result in small changes to employment, but the new large changes would result in large changes to employment. Second, how are these results similar or different in terms of the expanding geographical reach of the policies? This is a relatively new concept to the literature. If the results are similar across different types of places affected by the same policy, then perhaps the heterogeneity of places does not matter within this context.

In this paper, we evaluate the impacts of Alberta's $15 minimum wage policy on employment by applying a synthetic control technique on Labour Force Survey data cut by wages, ages, and places. Comparatively speaking, the only other studies on similar large minimum wage changes are that for Seattle and several other U.S. cities by Reich et al. (2017), Nadler et al. (2019), and Jardim et al. (2022), which also used a synthetic control technique. This makes these three studies the closest comparisons to our own, although ours is currently the only study for a state or province.

The only other studies of large minimum wage changes, which are also quite recent but not within North America, include Kreiner et al. (2020) on a similar magnitude change of 40 percent for youth in Denmark, and Gregory and Zierahn (2022) for construction workers in Germany. What we will learn from the Alberta case in the current study, given that the policy happened years before the previously mentioned provincial, state, territorial, and national policies to follow, will be influential in establishing what happens from this type of policy. Our study will also help shape how and what to learn from analyzing the next set of similarly large minimum wage policy changes.

2 Policies, Data, and Methods

Our polices, data, and methods are laid out respectively in subsections 2.1 (provincial minimum wage policies), 2.2 (Labour Force Survey data), and 2.3 (synthetic control methods). The evidence then follows in the next section.

2.1 Provincial Minimum Wage Policies

Following 44 consecutive years (1971-2015) of conservative party rule (under the Progressive Conservative Association), the New Democratic Party (NDP) formed Alberta's only one-term government (2015-2019). Prior to the NDP, Alberta had followed a formula-based approach to its minimum wage. For example, as of September 1st, 2011, the minimum wage formula was based equally on changes to annual average weekly earnings (AWE) and changes to the consumer price index (CPI). The NDP government decided to part ways with this formulaic approach in 2015, with the goal of moving the $10.20 minimum wage to a $15 level by 2018, which was part of their election platform (Alberta NDP, 2015). When Alberta returned to conservative rule (under the United Conservative Party) in 2019, the minimum wage was kept at the $15 level, where it remains at present.

According to Neumark et al. (2014, p. 610), "the identification of minimum wage effects requires both a *sufficiently sharp focus on potentially affected workers* and the construction of a *valid counterfactual control group* for what would have happened absent increases in the minimum wage." For the condition of a "valid counterfactual control group", there exists a similar or "twin" province of Alberta in Saskatchewan, which also continues to follow the same formula-based minimum wage approach that Alberta previously had. As discussed in Nadler et al. (2019), the ideal untreated

comparison units should follow the same minimum wage policy as Alberta would have followed in the absence of the $15 policy.

The provinces of Alberta and Saskatchewan have many similarities. Despite Saskatchewan having a little over a quarter of the population of Alberta, they are two of the youngest provinces in Canada, with median ages of 38.1 (AB) and 37.9 (SK) in 2021 versus a national median age of 41.1. Saskatchewan's economy is also equally reliant on agriculture and the energy extraction industry, being the second largest producer of both cattle and oil, behind only Alberta. Most importantly, Saskatchewan introduced their formulaic minimum wage approach in 2010, with its first increase in 2011. As of 2014, the minimum wage formula was based equally on changes to AWE and CPI for the previous year, with all changes also taking effect on October 1st, just like Alberta had.

Two other provinces can be used for comparative purposes based on proximity, previous history, and their own $15 minimum wage policies. British Columbia, Alberta's other neighboring province, on its western side, had a minimum wage indexed to inflation from at least 2015, but they also scrapped their formula approach later on in 2018 to set upon their own $15 path to $15.20 on June 1st, 2021. The province of Ontario is also of interest, in that its minimum wage was indexed to inflation in 2014, but this was done retroactively to 2010. As a result, there was one big increase in 2014 and then smaller annual changes until the formula was scrapped in 2018. Ontario was also on a $15 minimum wage path, with the largest one-time nominal increase of $2.60, from $11.40 to $14.00, on January 1st, 2018, but it was instead paused there. It then recently increased to $14.25 and to $14.35 on October 1st of 2020 and 2021, respectively, and then to $15.50 in October 2022.

Figure 1 shows the time series of minimum wages for this select set of Canadian provinces from 2008 to 2020. The minimum wage in Alberta (AB) increased

from $10.20 to $11.20 in 2015Q4, to $12.20 in 2016Q4, to $13.60 in 2017Q4, and to $15.00 in 2018Q4 (all happening on October 1st of their respective years). In contrast, Saskatchewan (SK) continues to display the automatically increasing minimum wage according to a formulaic approach, similar to what Alberta had prior to its $15 policy. The two other notable provinces appear somewhere in between these extremes, as both British Columbia (BC) and Ontario (ON) show sporadic periods of large minimum wage increases, especially notable towards the end of the period.

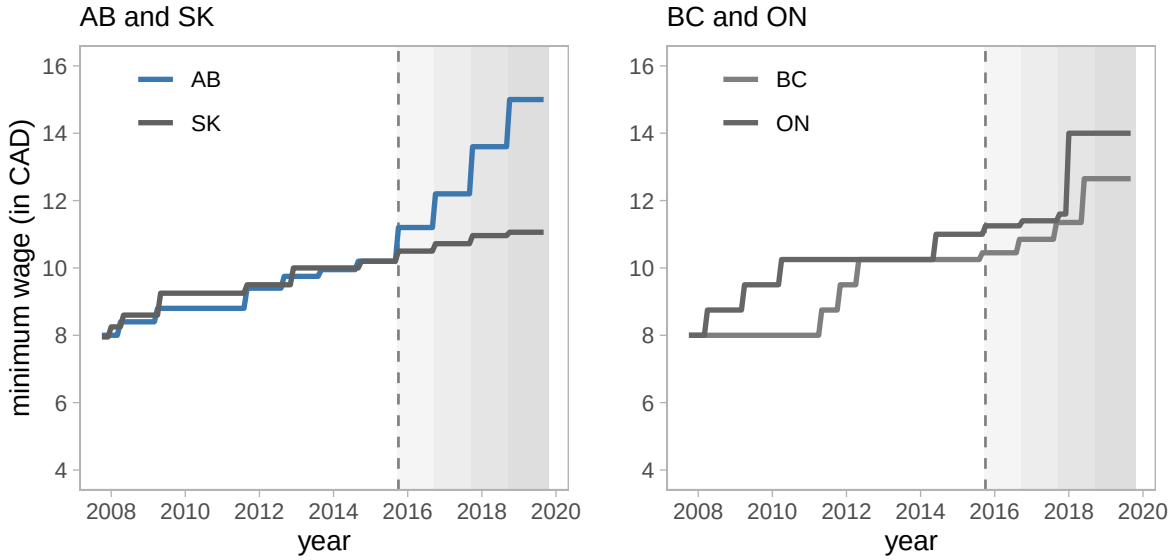

Figure 1: Minimum wage by province. Alberta (AB), Saskatchewan (SK), British Columbia (BC), and Ontario (ON). The shaded areas denote the four periods of minimum wage increases in Alberta after October 2015 (the post-intervention sample): from $10.20 to $11.20 in 2015Q4, to $12.20 in 2016Q4, to $13.60 in 2017Q4, and to $15.00 in 2018Q4. Source: Employment and Social Development Canada.

2.2 Labour Force Survey Data

For the "sufficiently sharp focus on potentially affected workers" required for the proper identification of minimum wage effects (again, from Neumark et al., 2014, p. 610), the order of our data "cuts" follow what was laid out in our paper's subtitle: "by

wages, ages, and places". As such, monthly employment data was obtained by age, region, and wage level from the Labour Force Survey (LFS) of Statistics Canada. The aggregate versions of the LFS data by age and region are publicly available from Statistics Canada, with Table 14-10-0287-01 (formerly CANSIM 282-0087) for age, which is seasonally-adjusted, and Table 14-10-0293-01 (formerly CANSIM 282-0122) for region, which is a three-month moving average. The wage bin cuts of the LFS data came through a request to Statistics Canada from the Government of Alberta, for the production of a report of the Minimum Wage Expert Panel (Marchand et al., 2020), which began in August 2019 and concluded at the end of February 2020.[4]

Our wage and age cuts of the data are used to tie our findings to the broader minimum wage literature. For wages, we divide employment into wage bins based on the step-wise set of minimum wage increases over the duration of Alberta's policy: those earning under $10.20, between $10.20 and $11.20, $11.20 to $12.20, $12.20 to $13.60, $13.60 to $15.00, $15.00 to $20.00, and above $20.00. These wage bins are used both as a source of variation and as an outcome of interest. Our wage bin approach is similar to Jales (2018) and Cengiz et al. (2019). We would expect a priori that workers will move up the wage bins as the minimum wage is incrementally increased, but workers in the wage bins above $15 are expected to be largely unaffected.

For ages, we isolate our youngest possible age group, aged 15-24, which contains teenagers (15-19), who are most likely to be affected by such a policy, and young adults (20-24), who are the second most likely to be affected. These groups are compared to those aged 25 and over. Cengiz et al. (2022) finds "age" to be the strongest predictor to being an affected worker of a minimum wage policy. A priori, we would expect younger workers to show some negative employment effects after the minimum wage

[4]While the aggregate version of the wage bin cuts is not publicly available, these can be aggregated using the publicly available micro data.

increases, but the older group of workers acts as a placebo, where no employment effect is expected.

Our cut of the data by places, namely economic regions, serves as our greater contribution to the literature. For places, we divide Alberta (and its neighboring provinces of Saskatchewan and British Columbia) into economic regions, of which there are seven in Alberta, with an assortment of two urban and five non-urban areas to consider. Cengiz et al. (2022) finds "rural" to be the fifth most important predictor to being an affected worker of a minimum wage policy. Given their higher price and wage levels, the urban areas are therefore seen as placebos a priori. However, the mostly lower-priced non-urban areas are expected to show some negative employment effects after the minimum wage increases.

Again, the purpose of our cuts of the data are to tie our findings to the broader minimum wage literature and then add our own more unique contribution to it. That said, there are other possible cuts to the data that are equally worthy of exploration, such as industry, immigrant status, or occupation. While our cuts of age and place follow the first and fifth best predictors of being affected by minimum wages from the approach of Cengiz et al. (2022), education, gender, and marital status are the second, third, and fourth best predictors, and Hispanic, race, and veteran status are the sixth, seventh, and eighth best predictors, respectively.

2.3 Synthetic Control Methods

Given the uniqueness of our policy, strength of our counterfactual, and ability to isolate our effects, we also add to our identification strategy through the use of a synthetic control approach. The reasons for this approach, especially for our policy and within our regional setting, are laid out by Abadie et al. (2010) and Abadie (2021), who

state the improvements over the other techniques applied in the literature. There have been at least nine other applications of synthetic controls to examine minimum wage policies, namely Sabia et al. (2012), Neumark et al. (2014), Dube and Zipperer (2015), Allegretto et al. (2017), Neumark and Wascher (2017), Reich et al. (2017), Nadler et al. (2019), Powell (2021), and Jardim et al. (2022).

The synthetic control approach is an attempt to form the counterfactual of what would have happened in Alberta without this policy, given the fact that *only* Alberta *with the policy* is actually observed. In this paper, separate synthetic controls are constructed for employment across different wage bins, age groups, and economic regions in Alberta. Our goal is to assess the impact of the minimum wage increases on employment for each of these groups.

For each treated Alberta unit, we construct a separate synthetic control based on the following model. Consider $J+1$ series of employment levels (Y_{jt}) observed over the sample $t = 1, \ldots, T$. Let $j = 0$ be the treated unit and $j = 1, \ldots, J$ be the control or untreated units. Let T_0 be the number of pre-intervention periods, with $1 < T_0 < T$. As in Abadie et al. (2010), the outcome to be estimated is what would have been observed for unit 0 if it had not been exposed to the intervention (i.e., the minimum wage increases) in periods $T_0 + 1$ to T.

In this paper, we adopt the Bayesian Structural Time Series (BSTS) approach of Varian (2014) and Brodersen et al. (2015) and define the synthetic control model as:

$$Y_{0t} = \alpha_t + \sum_{j=1}^{J} \beta_j Y_{jt} + \sum_{q=1}^{4} \delta_q Q_{qt} + \varepsilon_t \tag{1}$$

$$\alpha_t = \alpha_{t-1} + \nu_t, \tag{2}$$

where ε_t and ν_t are uncorrelated error terms with mean zero and variances, σ_ε^2 and

σ_ν^2, respectively. Each synthetic control, $\hat{Y}_{0t}$, is a function of untreated units (Y_{jt}, $j \geq 1$), a local level term (α_t), and quarterly seasonal dummy variables (Q_{qt}). The model is fitted to pre-treatment data using Bayesian methods (Gibbs sampling) and is used to construct $\hat{Y}_{0t}$ for the periods: $T_0 + 1$ to T. Bayesian estimation allows for the construction of posterior credibility intervals for $\hat{Y}_{0t}$ that account both for parameter uncertainty and model selection. See Varian (2014) and Brodersen et al. (2015) for more details. Following Nadler et al. (2019), we summarize the effect of the policy on each treated unit by averaging the difference between the actual employment levels and the synthetic values over the treatment period:

$$\text{Average effect} = \frac{1}{T - T_0} \sum_{t=T_0+1}^{T} (Y_{0t} - \hat{Y}_{0t}). \tag{3}$$

To construct the synthetic controls, we need to identify relevant untreated control units (the donor pool) and decide how to determine the regression coefficients (β_j and δ_q). For example, Jardim et al. (2022) use all of the counties within Washington state, 39 counties altogether, to examine the effects of a $15 minimum wage in Seattle. Other studies have used all 50 U.S. states (e.g., Abadie et al., 2010). For Canada, the state equivalent does not work with only ten provinces and three territories. In addition, some provinces also had large minimum wage increases, such as Ontario with the largest one-time increase in 2018, while the more eastern provinces and the territories do not provide relevant comparisons to Alberta.[5]

[5]It should be noted here that a border approach, made popular by Dube et al. (2010), cannot be done for Canadian studies of the minimum wage. First, Canada has a lot less people than in the U.S. overall (with roughly 11.5 percent of their population, country-to-country). Second, Canada also has far fewer provinces and territories (13), as compared to U.S. states (50). Third, Canada has fewer local labor markets, or notable urban areas, along the borders between provinces. One large urban area, Ottawa and Gatineau, between Ontario and Quebec, is probably the most notable example. More local to Alberta, but as a smaller city, Lloydminster, on the border between Alberta and Saskatchewan, is likely the best example, with a shared population of roughly 30,000.

In particular, we need to identify labor markets that were not exposed to large minimum wage increases, but also follow Alberta's labor market trends as tied to energy prices (see, e.g., Marchand, 2012, 2015, 2020).[6] In this paper, we mainly use Saskatchewan as the control province, based on its contiguity and economic fundamentals (similar to Card and Krueger, 1994), and in combination with the BSTS model, in order to select the subsets of workers in the donor pool that provide the best match for each treated Alberta unit. Finally, by using the BSTS approach of Brodersen et al. (2015), we are choosing to match pre-intervention outcomes, rather than a summary of covariates, such as sector composition (due to oil exposure) and demographics (due to the minimum wage).

For our main results, the set of untreated units ($Y_{jt}, j \geq 1$) includes Saskatchewan employment levels by wage bins (less than $10.20 an hour, between $10.20 and $11.20, between $11.20 and $12.20, between $12.20 and $13.60, between $13.60 and $15.00, between $15.00 and $20.00, and more than $20.00 an hour). The reason to slice the overall employment level into seven wage bins is that we do not know which groups may best model the trends in the different treated units we analyze. In addition, the donor pool also includes Alberta's employment level for workers earning more than $20.00 an hour. Our assumption again is that this group in Alberta is not affected by minimum wage increases, as they are far from the restriction and, simultaneously, will capture the time-varying Alberta factors better than the Saskatchewan data. In order to prevent over-fitting, we rely on regularized priors on the regression coefficients (see Brodersen et al., 2015). All of our models are estimated using quarterly averages for the pre-intervention sample from the fourth quarter (Q4) of 2007 to the third quarter

[6] Although an examination of oil price shocks and minimum wages is beyond the scope of our work, several studies have previously looked at the cyclical effects of minimum wages by analyzing their employment effects during recessions (Sabia, 2014, 2015; Clemens and Wither, 2019).

(Q3) of 2015 (i.e., eight years). The policy is evaluated in the post-intervention sample from the fourth quarter (Q4) of 2015 to the third quarter (Q3) of 2019 (i.e., four years). In each case, the Gibbs sampler is run 1,000 times.

3 Employment Effects of a $15 Minimum Wage

Our main evidence is reported in subsections 3.1 (by wages), 3.2 (by ages), and 3.3 (by places). Robustness results using alternative specifications of the synthetic control model are reported in subsection 3.4, as well as in the appendix. The final remaining section then concludes the paper.

3.1 By Wages: Workers Moved Up Bins

Our first cut of the Labour Force Survey data by wages is also the first attempt to answer our first main research question: Do these new types of policies, with large, unexpected, and quick minimum wage increases, offer results that are similar or different to the existing literature? In this wage cut, we would want to know if workers moved up the wage bins for each incremental minimum wage increase and how far the reach of the $15 policy was on the lower end of the wage distribution.

Distributional studies on minimum wages usually focus on what is happening to employment in wage bins near, but typically exactly at or above, the targeted minimum wage of the policy. For example, Cengiz et al. (2019) used a wage bin approach to estimate the effect of minimum wage increases on U.S. employment and found no effects in the bottom portion of the wage distribution. Jales (2018) used a similar approach for the middle income country of Brazil and its movements of workers in employment between the formal and informal sectors.

For our study, we first show the movement in employment between wage bins through each annual increment involved in Alberta's $15 minimum wage policy. As the minimum wage increases each year, workers in the applicable wage bin should have departed the previously existing lower wage bin, and then entered the higher wage bin immediately above it, and so on. Once again, the series of wage bins that correspond with the 2015-2018 increases in the minimum wage in Alberta are again: from $10.20 to $11.20, on October 1, 2015; from $11.20 to $12.20, on October 1, 2016; from $12.20 to $13.60, on October 1, 2017; and from $13.60 to $15.00, on October 1, 2018.

We follow the simplest way to show this effect, by looking at two particular aggregate wage bins: the $11.20 and below bin, which should show an employment decrease due to the policy, and the $11.20 to $13.60 bin, with the inclusion of the middle two incremental bins, which should show an employment increase and then decrease accordingly. The employment effects for this wage bin analysis are shown in Figure 2, with the top panel showing employment for $11.20 and below, and the bottom panel showing employment for $11.20 to $13.60. In both cases, the actual and synthetic employment series behave similarly until just before the first minimum wage increase to $11.20.

After October 2015, in contrast, the trend lines diverge significantly, as shown by movement of the actual trend (i.e., actual Alberta with the policy) outside of the statistical bounds of the synthetic trend (i.e. counterfactual Alberta without the policy). In the case of the $11.20 and below bin, actual employment levels are below those of the synthetic control almost immediately, as workers start moving out of this wage bin toward the limit of zero. In the case of the $11.20 to $13.60 bin, the actual employment level at first moves above that of the synthetic control, as many more workers suddenly appeared in these middle wage bins during the first two minimum wage increases. But,

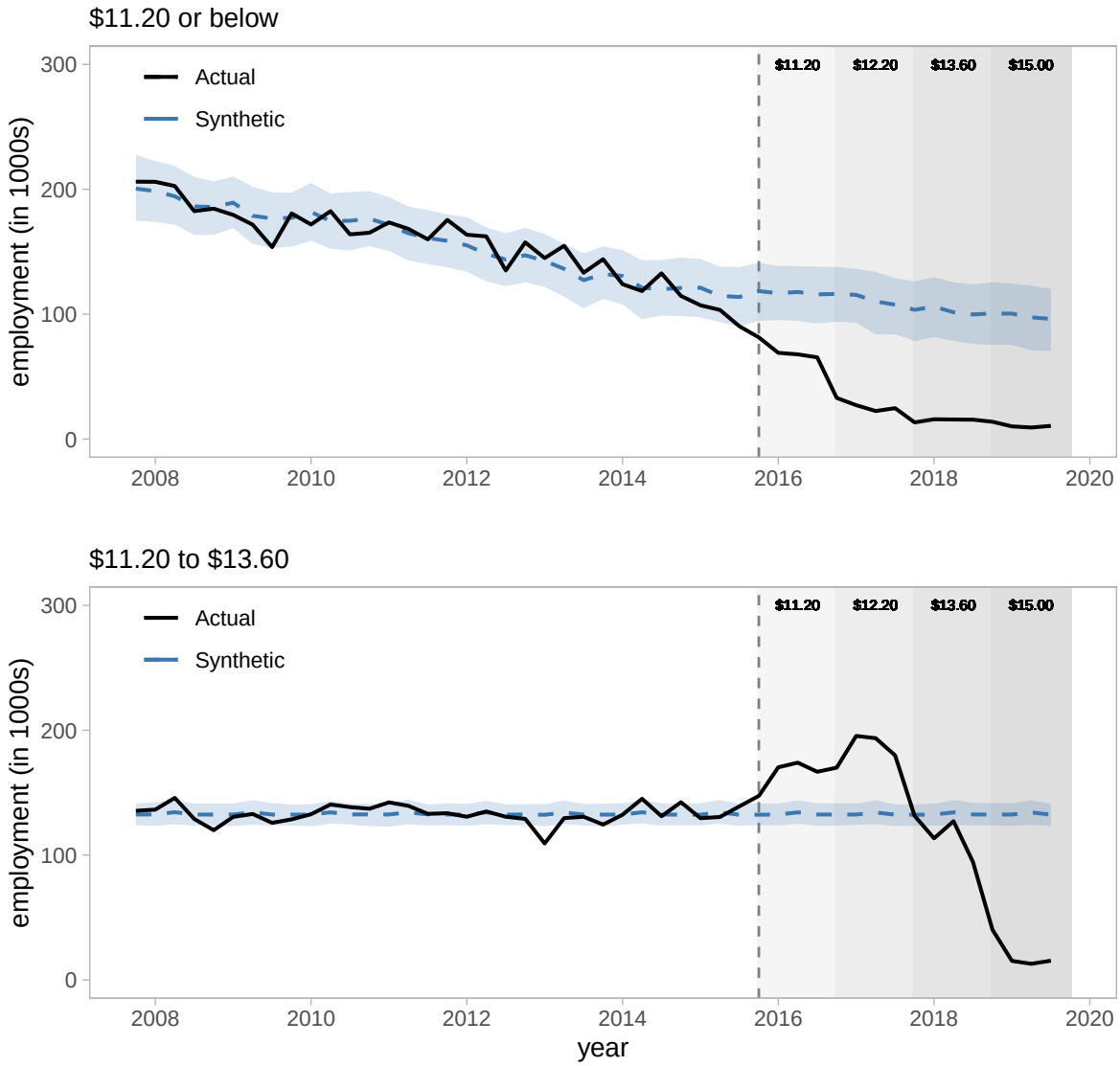

Figure 2: Employment effects of Alberta's $15 minimum wage by wage bins. Authors' calculations of Labour Force Survey data from Statistics Canada. The solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. The dashed blue lines show synthetic employment levels in Alberta (and 90% posterior probability intervals) without minimum wage changes. Only data before the first minimum wage increase in October 2015 (dashed vertical line) is used to fit the models.

as the minimum wage increased to $13.60, and then higher to $15.00, most workers moved out of those wage bins, again toward the limit of zero. Although we only show the middle two-bin results for brevity, we also did this analysis separately for each

incremental wage bin (e.g., see Figure A.1 of the appendix).

As for how far the reach of the $15 policy was on the lower end of the wage distribution, we turn to the descriptive statistics for each wage bin laid out in Table 1. The employment level and share of employment for each wage bin are shown for October 2014, before the policy, in the top panel, and for October 2018, after the policy was fully in place, in the bottom panel. Initially, in October 2014, the reach of the $15 minimum wage policy was just past the 15th percentile (15.86) of the wage distribution. This is found by adding up the employment shares in the top panel, from the $10.20 or less bin, through the $13.60 to $15.00 bin.

Table 1: Wage descriptive statistics by wage bin.

	10.20 or less	10.20 - 11.20	11.20 - 12.20	12.20 - 13.60	13.60 - 15.00	15.00 - 20.00	20.00 or more
A: October 2014							
employment	61.0	62.9	59.3	80.3	100.2	257.1	1,672.6
share	2.66%	2.74%	2.59%	3.50%	4.37%	11.21%	72.93%
B: October 2018							
employment	11.9	4.1	8.1	63.5	182.0	267.6	1,804.1
share	0.51%	0.18%	0.35%	2.71%	7.77%	11.43%	77.06%

Notes: Labour Force Survey data from Statistics Canada. Total employment in 1,000s.

How does that reach of this Alberta policy past the 15th percentile of the wage distribution compare to the previous research? For Canada, the answer would be that it is remarkably high, given that Campolieti (2015) found a lower distributional reach of the minimum wage, reaching only the 5th percentile for men and the 10th percentile for women. However, Autor et al. (2016) found impacts as high as the 10th percentile for men and the 25th percentile for women in the U.S.

3.2 By Ages: Youth Lost Employment

Our second cut of the LFS data is by ages, which continues our answer to the first main research question: Do these new types of large minimum wage changes offer results that are similar or different to the mostly small changes in the existing literature? Employment effects of minimum wage increases may differ by age, as Cengiz et al. (2022) show age to be the strongest predictor of being an affected worker due to a minimum wage policy. In this age cut, we will also show the magnitudes of the employment changes in terms of the implied elasticities. For example, if a similar employment elasticity to the literature is found, then those small minimum wage changes that previously occurred which resulted in small changes in employment, would now result in large changes to employment, given the large change in the minimum wage. In addition, we now first examine whether the "bite" of the minimum wage, using minimum-to-median wages, would have indicated any potential job loss.

The sign and significance of the employment effects of Alberta's $15 policy by age group are displayed in Figure 3. The top panel shows the actual and synthetic employment levels for older individuals, which notably behave similarly over our sample. As a result, we do not observe any significant job losses for older individuals due to the minimum wage increases. The bottom panel displays the employment of individuals aged 15 to 24. In this case, the results show that the actual and synthetic employment series behave similarly up to 2016Q4 and, as a result, we do not observe job losses immediately after the first minimum wage increase to $11.20. However, after the second increase to $12.20 in October 2016, the employment series diverge, and the actual employment levels are statistically below those of the synthetic control until the end of our sample, reflecting job loss for younger workers.

Most often, the minimum wage literature points to negative, but relatively small,

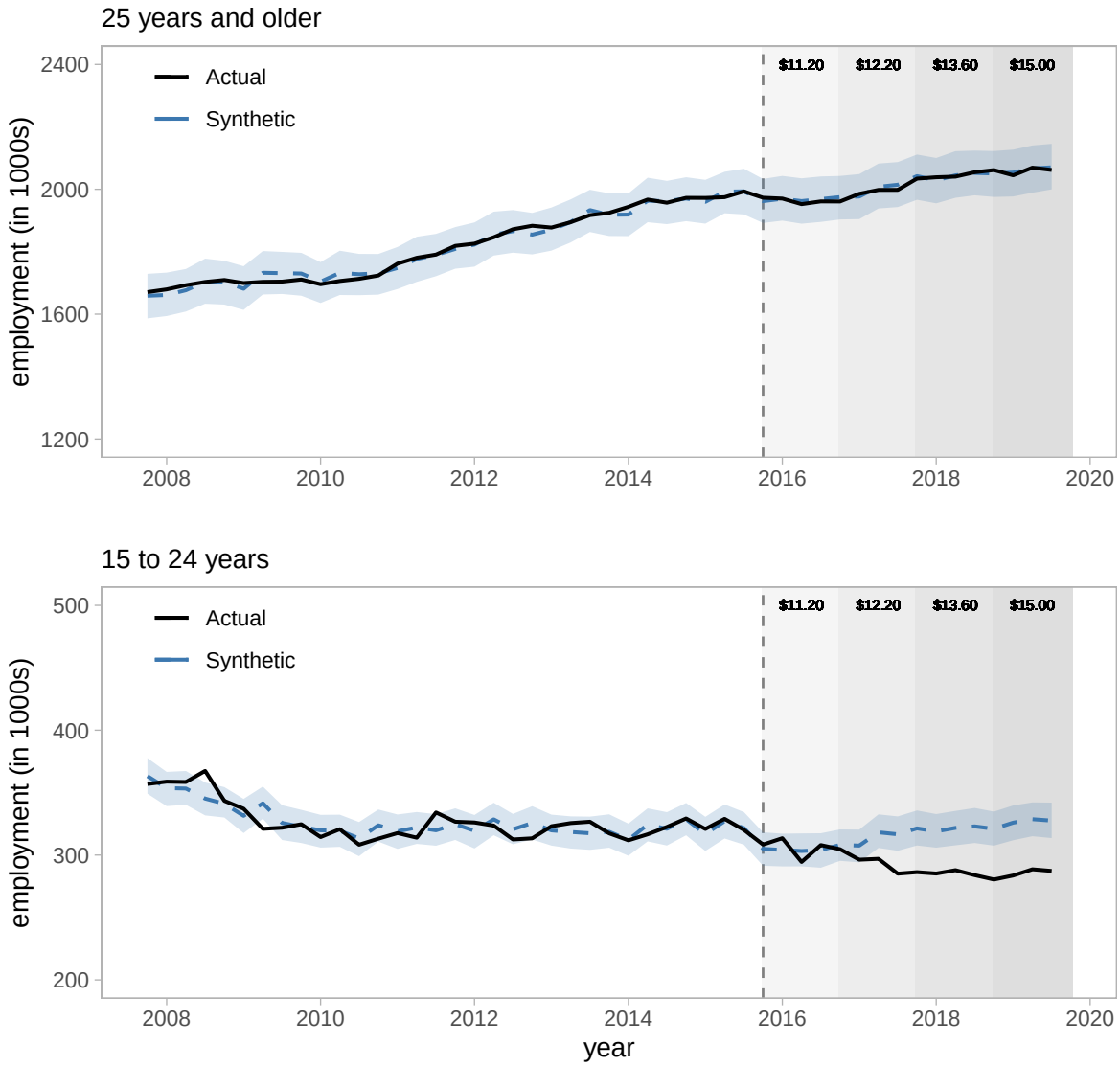

Figure 3: Employment effects of Alberta's $15 minimum wage by age groups. Authors' calculations of Labour Force Survey data from Statistics Canada. The solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. The dashed blue lines show synthetic employment levels in Alberta (and 90% posterior probability intervals) without minimum wage changes. Only data before the first minimum wage increase in October 2015 (dashed vertical line) is used to fit the models.

employment effects resulting from minimum wage increases, meaning that a small and negative elasticity exists between the minimum wage rate and employment, although

some small and positive effects have also been found.[7] The often-quoted U.S. elasticity estimates of -0.1 to -0.3 (Brown et al., 1982) imply that a 10 percent increase in the minimum wage reduces the affected employment, typically of teenagers and young adults, by 1 to 3 percent, but Brown (1999) then put that number closer to the lower bound of 1 percent. For Canada, these elasticity estimates are typically larger than for the U.S., ranging from -0.17 to -0.75 (Marchand, 2017). A recent meta-analysis of Canadian studies found an elasticity of about -0.27 (Campolieti, 2020), still within the original U.S. bounds.

The magnitude of the employment effects of Alberta's policy are summarized by age group in Table 2. The top panel reports the posterior mean treatment effect, its standard deviation, and the posterior tail-probability of no effect.[8] As expected, we find no evidence of employment losses for older workers (-0.00, std. dev. 0.01). In contrast, we find a significant employment loss for young individuals of 7 percent (-0.07, std. dev. 0.01), relative to their 2015Q3 employment level. Overall, this result implies an average loss of 22,783 jobs for young individuals due to the minimum wage increases, with a minimum wage employment elasticity of -0.15. The employment loss among young workers associated with this policy is similar to the back-of-the-envelope predictions for British Columbia (Green, 2015) and Alberta (Marchand, 2017), which had similarly sized labor forces, as well as consistent with previous elasticities of the literature between -0.1 to -0.3. We additionally find similar employment effects for

[7]For various reviews of the minimum wage literature, see Brown et al. (1982); Card and Krueger (1994, 1995); Brown (1999); Neumark and Wascher (2007, 2008); Neumark et al. (2014); Allegretto et al. (2017); Neumark and Wascher (2017); Dube (2019); and most recently, Neumark and Shirley (2022).

[8]For young individuals, our model identifies Saskatchewan employment for the $10.20 or less wage bin, and Alberta employment for the $20.00 or more wage bin, as the untreated units with the largest posterior probabilities of appearing in the synthetic control regression. In contrast, for older individuals, the only untreated unit that appears in the regression is Alberta employment for the $20.00 or more wage bin.

individuals aged 15 to 19 (-0.07, std. dev. 0.04) and 20 to 24 (-0.06, std. dev. 0.01), when analyzed separately (also shown in Figure A.2 of the appendix).

Table 2: Employment effects of Alberta's $15 minimum wage by age groups.

	25+	15-24	15-19	20-24
effect	-0.00	-0.07	-0.07	-0.06
std. dev.	0.01	0.01	0.04	0.01
prob.	0.44	0.00	0.02	0.00
employment	-2,583	-22,783	-7,120	-13,603
elasticity	-0.00	-0.15	-0.15	-0.13

Notes: Authors' calculations of Labour Force Survey data from Statistics Canada. The results are obtained using SK employment levels by wage bins and AB's employment level for the $20.00 or more wage bin as untreated units. The models are estimated using quarterly averages and the pre-intervention sample 2007Q4-2015Q3. The policy is evaluated in the post-intervention sample 2015Q4-2019Q3. The top panel reports the posterior mean treatment effect as fraction of 2015Q3 employment (*effect*), posterior standard deviations (*std. dev.*), and the posterior tail-probability of no effect (*prob.*). The implied employment effects and employment elasticities are reported in the bottom panel. Minimum wage employment elasticities are computed as the percentage change in employment divided by percentage change in minimum wage in the post-intervention sample.

But what about the bite of the minimum wage, in terms of where these negative employment effects may become significant? One way to anticipate the relative employment impacts of minimum wage increases, such as across different age groups or geographies, is to use the ratio of the minimum wage relative to the median wage for each age or area. Fortin (2010) was the first to use this approach for Canada, suggesting that the province of Quebec keep its minimum wage below the 45 percent threshold, in order to minimize any employment impacts. Cengiz et al. (2019) recently showed evidence consistent with that finding, although the threshold for negative employment effects might be 60 percent or higher. This minimum-to-median wage measure is also known as the Kaitz index.

Table 3 presents average, median, and minimum wage rates by age group between Alberta and Saskatchewan. In October 2014, a year before the first large minimum wage increase, the nominal minimum wage was $10.20 in both provinces, and the minimum-to-median wage ratio was around 40 percent for older workers (25 years and older). This ratio for young workers (15 to 24 years) was already over 60 percent in both provinces at that time. By October 2018, after the last minimum wage increase in our sample, the nominal minimum wage reached $15.00 in Alberta, but it was only $11.06 in Saskatchewan. As a result, the minimum-to-median wage ratio in Alberta increased to at least 50 percent for prime-age and older workers, and it was as high as 92 percent for young workers, close to the 100 percent post-reform bite reported in Gregory and Zierahn (2022). In contrast, the minimum-to-median wage ratio remained (mostly) unchanged in Saskatchewan in the post-intervention sample.

Table 3: Wage descriptive statistics by age.

	Alberta			Saskatchewan		
	15-24	25-54	55-64	15-24	25-54	55-64
A: October 2014						
Average wage	17.74	30.27	31.25	16.86	27.66	26.99
Median wage	16.00	27.00	28.00	15.00	25.00	24.00
Minimum wage	10.20	10.20	10.20	10.20	10.20	10.20
Minimum/median wage	0.64	0.38	0.36	0.68	0.41	0.43
B: October 2018						
Average wage	18.27	33.04	32.83	16.87	29.65	29.42
Median wage	16.25	30.00	28.00	15.00	27.00	25.20
Minimum wage	15.00	15.00	15.00	11.06	11.06	11.06
Minimum/median wage	0.92	0.50	0.54	0.74	0.41	0.44

Notes: Labour Force Survey data from Statistics Canada. Average, median, and minimum wage rates in CAD per hour.

3.3 By Places: Non-Urban Areas Lost Employment

Our third and final cut of the LFS data is by place, beginning with urban versus non-urban areas, but it also includes more nuance, such as by evaluating the effects for each economic region within Alberta and showing cross-tabulations by place with age. This also includes displaying employment changes and elasticities similar to the age cut, as well as showing the minimum-to-median wage ratios by region. This all helps us answer our second main research question, which is a relatively new concept to the literature: How are these results similar or different in terms of the expanding geographical reach of the policies? For example, if the results are similar across different types of places affected by the same policy, then it would imply that the heterogeneity of places may not matter in this context.

Employment effects of minimum wage increases may differ by geography, in that employers in large urban areas might be better able to absorb the employment impacts of significant minimum wage increases, compared to non-urban areas, due to their higher price and wage levels. New York state's geographic roll-out of its $15 minimum wage, from New York City, to its suburbs and then beyond, follows this logic. Similarly, Cengiz et al. (2022) found "rural" to be the fifth most important predictor to being an affected worker by a minimum wage. Further, Azar et al. (2019) showed that the less concentrated a labor market is, like in a rural area, the more negative the employment effects are from the minimum wage; and the more concentrated it is, like in heavily urbanized areas, the less negative the effects are, to the point that they turn positive in the most concentrated labor markets.

As the reach of these large minimum wage changes expands outward in geography, from the local city or municipality, to the state, province, or territory, and then even to the nation, more and more heterogeneity will exist in the price and wage levels across

the locations that are covered by such a policy. While previous research using a wider geography has mainly had small changes in the minimum wage, more recent examples have instead examined large changes in a small geography, like Seattle. While the Seattle studies (see Reich et al., 2017; Jardim et al., 2022) allow us to see how a city policy compares to no change in policy for the rest of the state, they do not allow for a regional analysis of a policy spread out across several regions within a state or province as provided by our Alberta policy example.

The province of Alberta can be divided into seven economic regions within the LFS data: two urban regions (Calgary, R2, and Edmonton, R4) and five considered to be non-urban regions (Banff, Jasper, and Rocky Mountain House, R1; Camrose and Drumheller, R3; Lethbridge, R5; Red Deer, R6; Wood Buffalo and Cold Lake, R7).[9] As a result, here we ask whether individuals in Alberta's non-urban areas were more negatively impacted by the increase in the minimum wage. This follows the suggestion for a more local approach to measure minimum wage effects (Thompson, 2009). However, in using economic regions rather than Census divisions, it also offers a more aggregated approach than other previous local labor market analyses of Western Canada (Marchand, 2012, 2015, 2020).

The employment effects of Alberta's $15 policy by region type are presented in Figure 4.[10] The top panel shows employment for the urban regions of Calgary and Edmonton, while the bottom panel shows employment for the five non-urban regions.

[9]Four months of missing employment observations in the data are given imputed values for the Wood Buffalo and Cold Lake Economic Region, for June, July, August, and September of 2016, due to the Fort McMurray wildfire, by averaging from the May 2016 value of 9.5 to the October 2016 value of 9.1.

[10]For the urban regions, our model mainly identifies Alberta employment for the $20.00 or more wage bin as the untreated unit with the largest posterior probability of appearing in the synthetic control regression. For the non-urban regions, our model identifies Saskatchewan employment for the $10.20 or less wage bin, the $12.20 to $13.60 wage bin, and the $20.00 or more wage bin, as well as Alberta employment for the $20.00 or more wage bin, as the untreated units with the largest posterior probabilities.

As in the previous figures, Figure 4 compares the actual and synthetic employment levels for the period (2007Q4 to 2019Q3). For our urban regions, the actual and synthetic employment series behave similarly until the end of our sample and, as a result, we do not observe significant job losses for these two regions due to the minimum wage increases. For the remaining five regions of Alberta, the actual and synthetic employment series behave similarly until 2015Q3, when the first minimum wage increase to $11.20 was implemented. After October 2015, the series diverge and actual employment levels are below those of the synthetic control.

The magnitude of the employment effects of Alberta's minimum wage policy are summarized by place and age in Table 4, again reporting the posterior mean treatment effect, its standard deviation, and the posterior tail-probability of no effect. As expected, we find no evidence of employment losses for urban workers (-0.00, std. dev. 0.01). In contrast, we find a significant loss of employment for non-urban workers of 4 percent (-0.04, std. dev. 0.00), relative to their 2015Q3 employment level, implying an average loss of 29,163 jobs for this group due to the minimum wage and a minimum wage employment elasticity of -0.09. Our results for older workers (aged 25+) in non-urban areas are similar, as we again find a significant loss of employment of 4 percent (-0.04, std. dev. 0.01). There is, however, no evidence of employment losses for older workers in urban areas (0.01, std. dev. 0.01). In contrast, we find a significant loss of employment of 8 percent for young workers (aged 15 to 24) for both urban (-0.08, std. dev. 0.01) and non-urban (-0.08, std. dev. 0.02) workers (see Figures A.3 and A.4 of the appendix).

Next, we evaluate the employment effects of Alberta's policy separately for each economic region. The results, summarized in Table 5, show no significant employment losses when employment is analyzed separately for Calgary (R2) and Edmonton (R4)

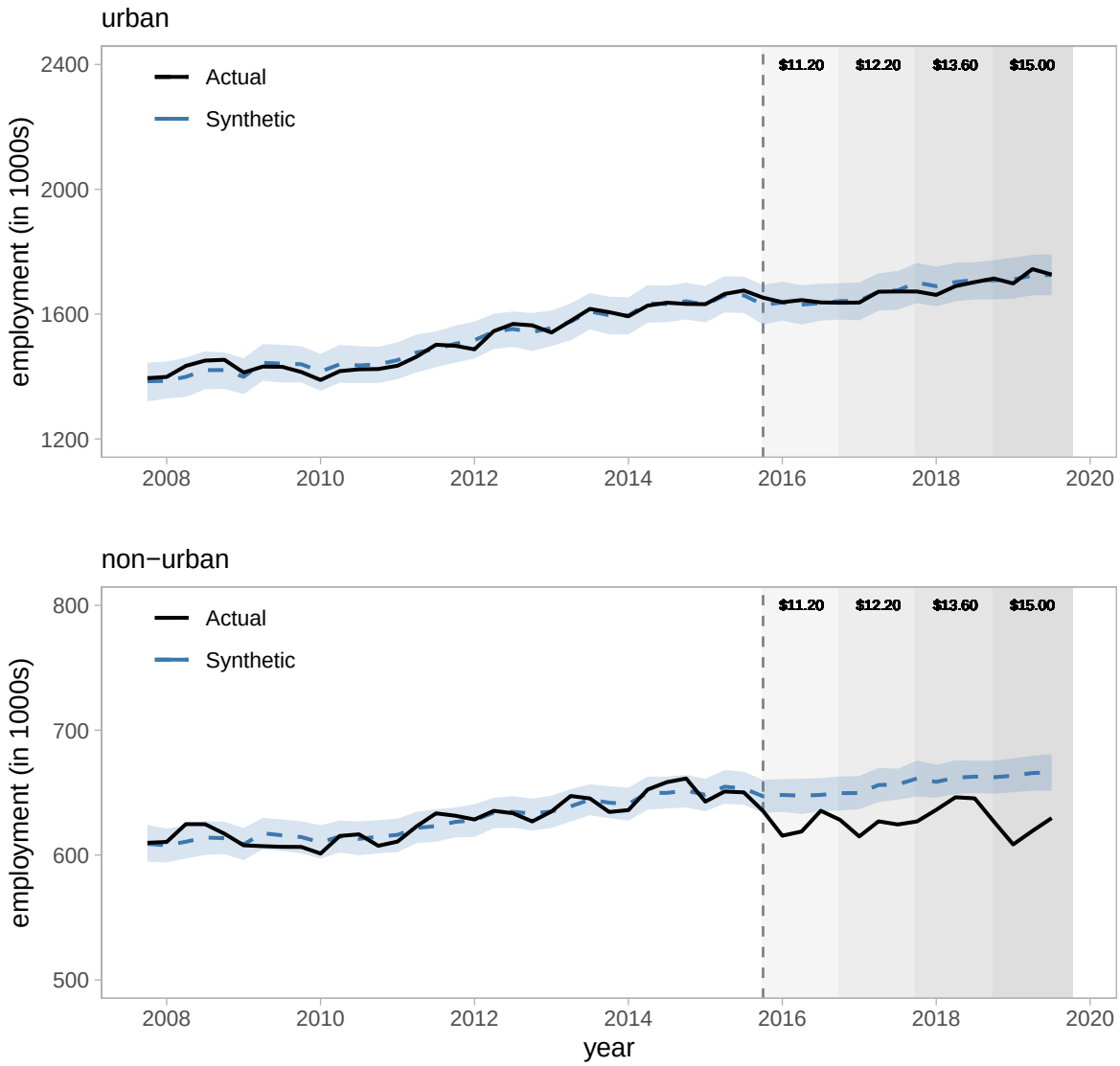

Figure 4: Employment effects of Alberta's $15 minimum wage by economic regions. Authors' calculations of Labour Force Survey data from Statistics Canada. The solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. The dashed blue lines show synthetic employment levels in Alberta (and 90% posterior probability intervals) without minimum wage changes. Only data before the first minimum wage increase in October 2015 (dashed vertical line) is used to fit the models.

(-0.00, std. dev. 0.01). This is consistent with our overall results for our more general urban workers above. In contrast, our results for the five non-urban regions exhibit some heterogeneity. While four of the five non-urban regions showed significant em-

Table 4: Employment effects of Alberta's $15 minimum wage by place.

	urban			non-urban		
	overall	25+	15-24	overall	25+	15-24
effect	-0.00	0.01	-0.08	-0.04	-0.04	-0.08
std. dev.	0.01	0.01	0.01	0.00	0.01	0.02
prob.	0.43	0.12	0.00	0.00	0.00	0.00
employment	-2,274	18,050	-17,719	-29,163	-21,835	-7,798
elasticity	-0.00	0.02	-0.17	-0.09	-0.09	-0.17

Notes: Authors' calculations of Labour Force Survey data from Statistics Canada. The results are obtained using SK employment levels by wage bins and AB's employment level for the $20.00 or more wage bin. The models are estimated using quarterly averages and the pre-intervention sample 2007Q4-2015Q3. The policy is evaluated in the post-intervention sample 2015Q4-2019Q3. The top panel reports the posterior mean treatment effect as fraction of 2015Q3 employment (*effect*), posterior standard deviations (*std. dev.*), and the posterior tail-probability of no effect (*prob.*). The implied employment effects and employment elasticities are reported in the bottom panel. Minimum wage employment elasticities are computed as the percentage change in employment divided by percentage change in minimum wage in the post-intervention sample.

ployment losses between 5 and 7 percent, with elasticities ranging between -0.11 and -0.15, Lethbridge (R5) showed a small employment gain of 2 percent (0.02, std. dev. 0.01), although it was not statistically significant.

One way to anticipate the relative employment impacts across different geographies, which are applying the same (or a similar) nominal standard of a $15 minimum wage, is to use the ratio of the minimum-to-median wage for each area, as was similarly done for age groups between Alberta and Saskatchewan. Table 6 presents the average, median, and minimum wage rates for each of Alberta's economic regions. While the average wage of the Wood Buffalo and Cold Lake region ($34.61) was higher than the main cities of Calgary ($30.96) and Edmonton ($30.97) in 2018, mainly due to the heavy presence of energy extraction in that area, the average wage of the two urban regions was above those of the other four non-urban ones (at $30.48, $27.60, $27.68,

Table 5: Employment effects of Alberta's $15 minimum wage by economic regions.

	urban		non-urban				
	R2	R4	R1	R3	R5	R6	R7
effect	-0.00	-0.00	-0.06	-0.07	0.02	-0.05	-0.06
std. dev.	0.01	0.01	0.01	0.01	0.01	0.01	0.01
prob.	0.47	0.41	0.00	0.00	0.07	0.00	0.00
employment	-588	-1,864	-11,810	-8,012	3,039	-6,411	-5,064
elasticity	-0.00	-0.00	-0.13	-0.15	0.04	-0.11	-0.13

Notes: Authors' calculations of Labour Force Survey data from Statistics Canada. The results are obtained using SK employment levels by wage bins and AB's employment level for the $20.00 or more wage bin. The models are estimated using quarterly averages and the pre-intervention sample 2007Q4-2015Q3. The policy is evaluated in the post-intervention sample 2015Q4-2019Q3. The top panel reports the posterior mean treatment effect as fraction of 2015Q3 employment (*effect*), posterior standard deviations (*std. dev.*), and the posterior tail-probability of no effect (*prob.*). The implied employment effects and employment elasticities are reported in the bottom panel. Minimum wage employment elasticities are computed as the percentage change in employment divided by percentage change in minimum wage in the post-intervention sample. The two urban regions are Calgary (R2) and Edmonton (R4). The five non-urban regions are Banff, Jasper, and Rocky Mountain House (R1), Camrose and Drumheller (R3), Lethbridge (R5), Red Deer (R6), and Wood Buffalo and Cold Lake (R7).

and $28.91). The minimum-to-median wage ratio was around 40 percent in all seven economic regions in October 2014. By October 2018, however, the minimum-to-median wage ratio in Alberta's urban regions increased to over 50 percent (but was still less than 60 percent threshold), while this ratio increased to 60 percent or above in three of the five non-urban regions.

3.4 Robustness

Altogether, our estimates have been remarkably consistent. That said, we aim to be as transparent as possible in the application of our synthetic control approach and with how robust our results are to multiple specifications of those controls. We do so by

Table 6: Wage descriptive statistics by place.

	urban		non-urban				
	R2	R4	R1	R3	R5	R6	R7
A: October 2014							
Average wage	29.41	27.62	27.82	26.72	23.77	26.73	32.54
Median wage	25.00	24.03	25.00	24.48	20.60	24.04	29.72
Minimum wage	10.20	10.20	10.20	10.20	10.20	10.20	10.20
Minimum/median wage	0.41	0.42	0.41	0.42	0.50	0.42	0.34
B: October 2018							
Average wage	30.96	30.97	30.48	27.60	27.68	28.91	34.61
Median wage	26.00	27.00	28.00	24.95	23.00	24.00	31.00
Minimum wage	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Minimum/median wage	0.58	0.56	0.54	0.60	0.65	0.63	0.48

Notes: Authors' calculations of Labour Force Survey data from Statistics Canada. Average, median, and minimum wage rates in CAD per hour. The two urban regions are Calgary (R2) and Edmonton (R4). The five non-urban regions are Banff, Jasper, and Rocky Mountain House (R1), Camrose and Drumheller (R3), Lethbridge (R5), Red Deer (R6), and Wood Buffalo and Cold Lake (R7).

following the various suggested ways of doing robustness checks by Samartsidis et al. (2019) and Abadie (2021).

First, we evaluate the robustness of the results to the sample used to estimate the models. Our main results use an eight-year sample (2007Q4-2015Q3). We also report results obtained using four years (2011Q4-2015Q3) and twelve years (2003Q4-2015Q3) of pre-intervention data. In both cases, we find results that are consistent with our main results reported above. In this case, we find a significant loss of employment of 9 percent for young workers and 5 percent for non-urban workers. In contrast, we again find no evidence of employment losses for older workers or urban workers. These results are shown in Panel B of Table 7 and Figures B.1 to B.4 of the appendix.

Second, we evaluate the robustness of the results to the selection of untreated units used to construct the synthetic controls. We consider the following changes

Table 7: Employment effects under different specifications.

	by age		by place	
	25+	15-24	urban	non-urban
A: Main results				
As fraction of 2015Q3 employment	-0.00	-0.07	-0.00	-0.04
B: Changing the pre-intervention sample				
2011Q4-2015Q3 (4 years)	0.00	-0.09	-0.00	-0.05
2003Q4-2015Q3 (12 years)	0.01	-0.09	0.01	-0.05
C: Changing the donor pool				
Only SK wage bin data	0.01	-0.07	0.01	-0.04
Adding BC wage bin data	-0.00	-0.07	-0.00	-0.05
Using regional data	0.02	-0.13	-0.06	-0.11
Using regional data (excl. Vancouver)	0.02	-0.09	0.01	-0.03
D: Backdating to 2013Q3				
2013Q4-2015Q3 (in-time placebo test)	0.01	-0.01	0.01	-0.01
2015Q4-2019Q3 (intervention)	0.01	-0.09	0.01	-0.05
E: Backdating to 2011Q3				
2011Q4-2015Q3 (in-time placebo test)	0.02	0.00	0.02	-0.02
2015Q4-2019Q3 (intervention)	0.03	-0.09	0.03	-0.07

Notes: Authors' calculations of Labour Force Survey data from Statistics Canada. The main results are obtained using SK employment levels by wage bins and AB's employment level for the $20.00 or more wage bin. The models are estimated using quarterly averages and the pre-intervention sample 2007Q4-2015Q3, unless stated otherwise. Figures for all of the robustness exercises are reported in the appendix. The policy is evaluated in the post-intervention sample 2015Q4-2019Q3.

to the donor pool ($Y_{jt}, j \geq 1$) used to obtain the main results: (i) drop Alberta employment data from the set of untreated units and use only Saskatchewan data; (ii) add British Columbia employment data sliced by wage bins in the same way as the Saskatchewan data; (iii) slice British Columbia and Saskatchewan employment data by economic regions instead of wage bins and, (iv) slice British Columbia and Saskatchewan employment data by economic regions, but we exclude the Vancouver

economic region, as there is no equivalent Alberta comparison. In this case, we find that the results are sensitive to the choice of controls. Nevertheless, our main results are the most conservative estimates we obtain. These results are shown in Panel C of Table 7 and Figures C.1 to C.8 of the appendix.

Third, we evaluate the robustness of the results to backdating the intervention two years (to 2013Q3) and four years (to 2011Q3). As discussed in Abadie et al. (2015) and Abadie (2021), this is, effectively, an in-time placebo test. As a result, we should not find effects prior to the actual intervention date. Our robustness results show small and insignificant employment losses in the periods immediately before the intervention. After the intervention, we find employment losses that are similar to those reported above. However, the precision of our results deteriorates when the intervention is backdated four years. These results are shown in Panels D and E of Table 7 and Figures D.1, D.2, E.1, and E.2 of the appendix.

Overall, our robustness results reported in Table 7 and in the appendix suggest that any potential job loss was entirely experienced by younger Albertans, with a loss of employment estimated to be between 7 and 13 percent, relative to the 2015Q3 employment level for this group. Similarly, our results suggest a loss of employment estimated to be between 3 and 13 percent for the non-urban group, relative to its 2015Q3 employment level. Finally, the in-time placebo tests show minimal effects on employment by age group or economic region.

4 Conclusion

The minimum wage literature has mostly produced employment estimates which are identified over small, plentiful, and expected changes to the minimum wage that are

spread out over time. A recent set of minimum wage policies have instead been large in magnitude, unexpected to many, relatively quick in their roll-out, and typically focused around a nominal level of $15, regardless of country, currency, or initial price and wage levels. In order to state something normative about these new policies, we must first be able to say something positive through empirical investigation. In doing so, we attempt to answer: 1) whether one of these large magnitude policies produces results that are similar or different to the smaller magnitude policies that came before it and, 2) whether the expanding geographical reach of this large magnitude policy produces results that are similar or different across the heterogeneous places that it covers.

As the first province or state in North America to have a $15 minimum wage, Alberta became the "First to $15" on October 1st, 2018. Resulting from a sudden and unexpected change in government, this policy scrapped the previous minimum wage formula, based evenly on annual growth in earnings and prices, for a large nominal increase of 47 percent through four incremental increases over a short duration of 3 years. Our study examines the impacts of this policy on employment using synthetic control methods applied to Labour Force Survey data from Statistics Canada. For our counterfactual, we mostly compare Alberta, with its new and unexpected policy, to the neighboring province of Saskatchewan, with its automatic and formula-based minimum wage, similar to Alberta's previous policy.

As highlighted by the subtitle of the paper, our evidence falls into three different cuts of employment outcomes, by wages, ages, and places, with the first two mainly tying to the broader literature and the third mostly serving as our greater contribution. Our first main research question was whether these new types of policies, containing large, unexpected, and quick minimum wage increases, offer results that are similar or

different to the existing literature. When analyzing employment movements in and out of the wage bins, set according to the incremental increases and analyzed before and after each change, a significant number of workers moved up bin-by-bin according to each increase. This is to be expected from a minimum wage policy, in that the raised minimum wage is no longer allowing employment in those lower bins, validating our method.

However, not all of the workers from the lower wage bins made appearances in the higher wage bins during these movements. When the policy is examined by age group, employment losses were found among the young (aged 15 to 24), while no employment loss was found among older individuals (aged 25 and over). The magnitude of the employment losses and their implied elasticities were in line with the literature, despite being produced from such a different type of minimum wage policy. That said, the effect was consistent across teens (15 to 19) and slightly older workers (20 to 24), which is not always the case. In addition, Alberta's $15 minimum wage policy had a higher distributional reach than previous Canadian policies, and the minimum-to-median wage ratios showed where the losses would be and were remarkably high for affected groups after the policy was fully in place.

Our second main research question was whether our results similar or different in terms of the expanding geographic reach of the policies, which is a relatively new contribution. When the policy is examined by region, employment losses were found for the five non-urban regions, whereas employment losses in the two urban areas were insignificant. The magnitudes and elasticities are remarkably consistent with those for age, in terms of affected ages and places. Therefore, although Cengiz et al. (2022) found "rural" to be much less of an important factor than "age" in determining the affected individuals of a minimum wage policy, we instead find it to be equally important, with

almost equal magnitudes of employment losses between the two factors. When mixing place and age, youth losses and older employment gains almost equally offset in the urban areas. And once again, the minimum-to-median wage ratios showed where the employment losses would occur, with one exception.

The main takeaway points from Alberta's policy are that the employment effects, which were negative and significant, were only found among the young who were more likely to be employed at lower wages, and were only found within the non-urban regions with lower relative price and wage levels than urban areas. But despite how large, quick, and unexpected the increases were, the elasticities were almost exactly in line with the literature. As more of these large minimum wage changes, to and above the nominal $15 minimum wage threshold, get introduced while expanding their geographic reach, to the next set of U.S. states, Canadian provinces and territories, and possibly to Canada and the U.S. themselves, the Alberta case can serve as an example of what might be. However, the more heterogeneity of localities within that future geographic reach, the more that uncertainty of the prediction would be introduced.

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2.3, 2.3

First to $15: Alberta's Minimum Wage Policy on Employment by Wages, Ages, and Places *

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Online Appendix

This version: December 23, 2022

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1 Additional Results

1.1 Results by Wage

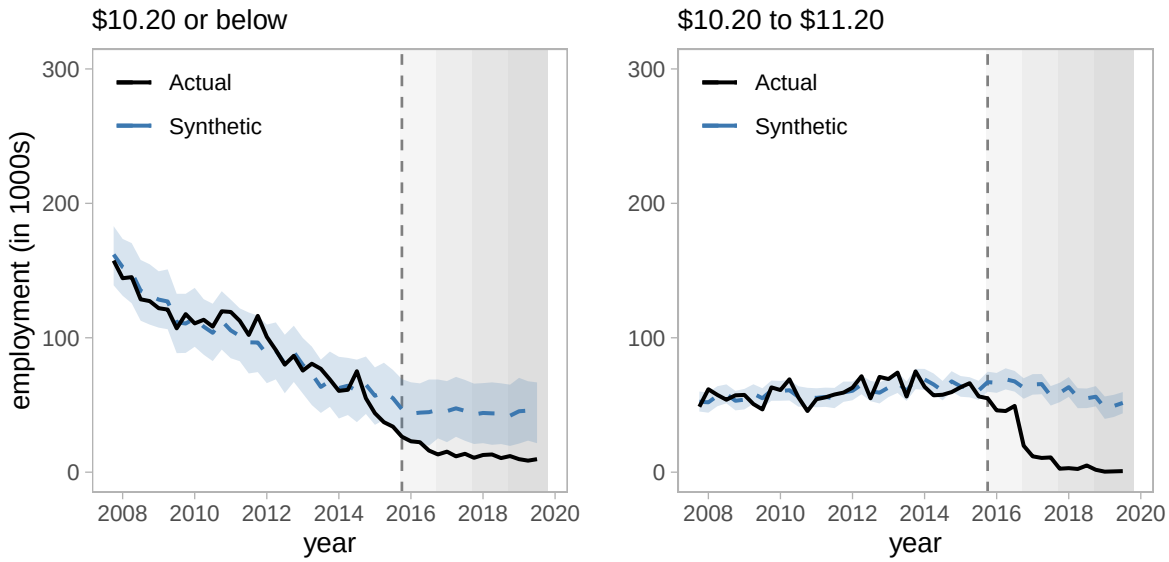

Figure A.1: Main results (by wage, bottom bins). Employment effects of Alberta's $15 minimum wage by wage bins. Authors' calculations of Labour Force Survey data from Statistics Canada. The solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. The dashed blue lines show synthetic employment levels in Alberta (and 90% posterior probability intervals) without minimum wage changes. Only data before the first minimum wage increase in October 2015 (dashed vertical line) is used to fit the models.

1.2 Results by Age

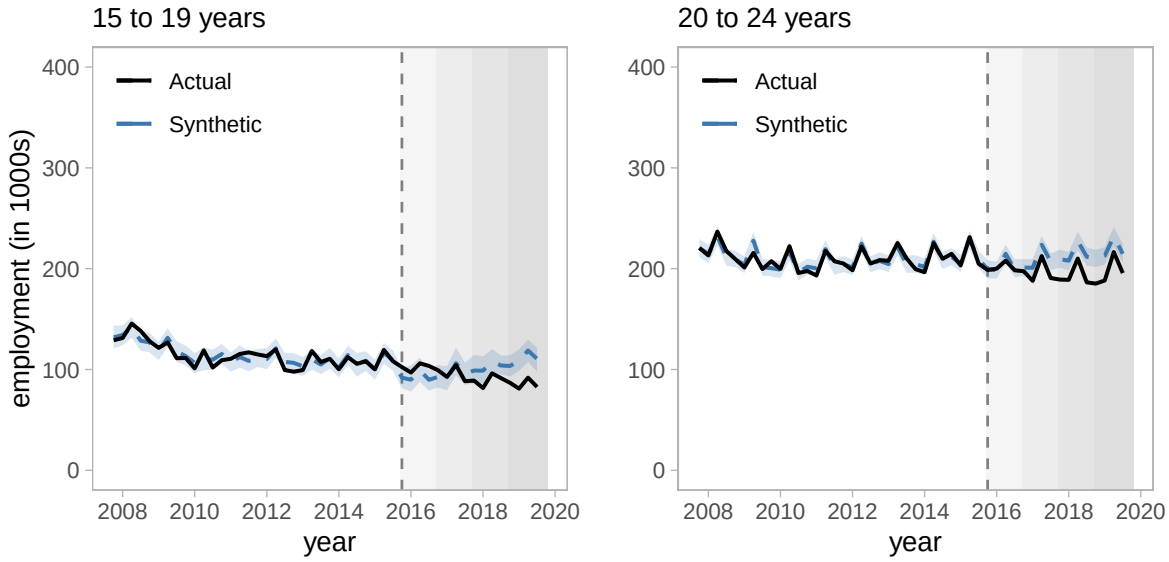

Figure A.2: Main results (by age, young workers). Employment effects of Alberta's $15 minimum wage by age groups. Authors' calculations of Labour Force Survey data from Statistics Canada. The solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. The dashed blue lines show synthetic employment levels in Alberta (and 90% posterior probability intervals) without minimum wage changes. Only data before the first minimum wage increase in October 2015 (dashed vertical line) is used to fit the models.

1.3 Results by Place

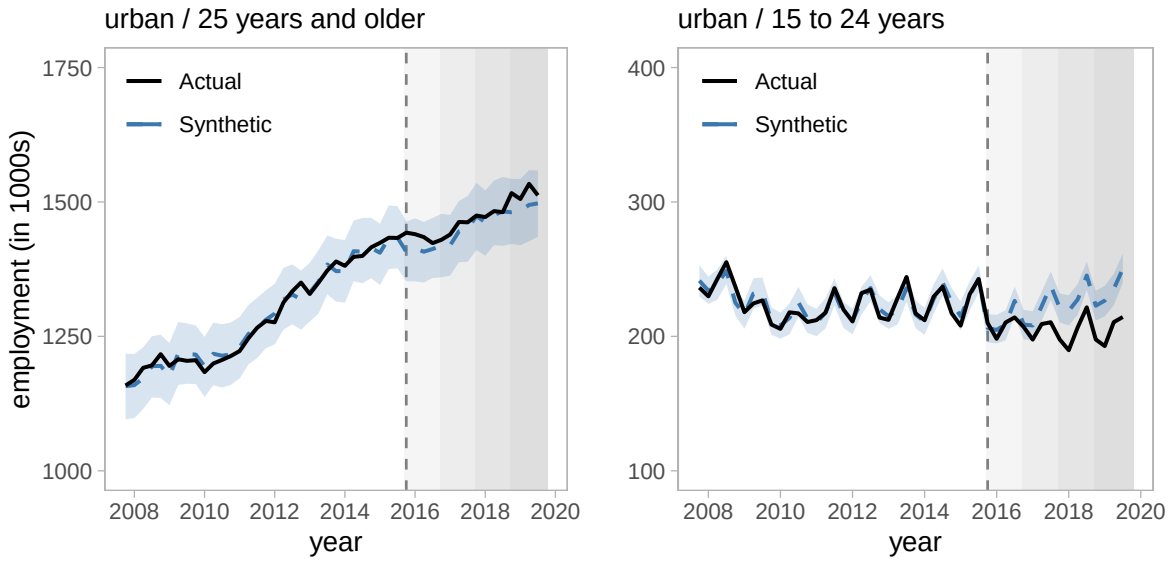

Figure A.3: Main results (urban workers, by age). Employment effects of Alberta's $15 minimum wage by economic regions. Authors' calculations of Labour Force Survey data from Statistics Canada. The solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. The dashed blue lines show synthetic employment levels in Alberta (and 90% posterior probability intervals) without minimum wage changes. Only data before the first minimum wage increase in October 2015 (dashed vertical line) is used to fit the models.

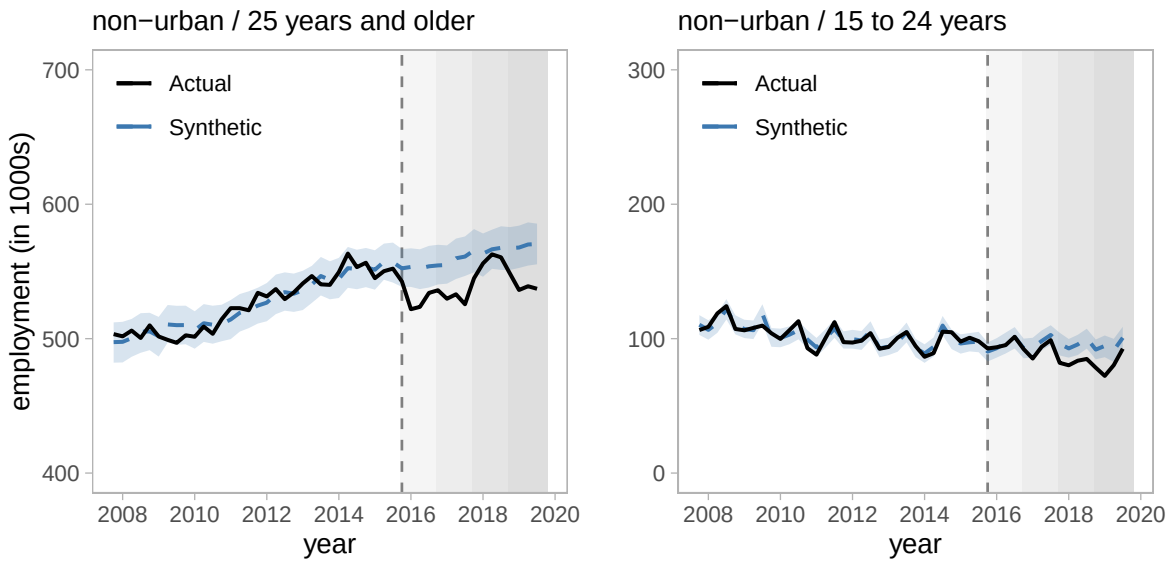

Figure A.4: Main results (non-urban workers, by age). Employment effects of Alberta's $15 minimum wage by economic regions. Authors' calculations of Labour Force Survey data from Statistics Canada. The solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. The dashed blue lines show synthetic employment levels in Alberta (and 90% posterior probability intervals) without minimum wage changes. Only data before the first minimum wage increase in October 2015 (dashed vertical line) is used to fit the models.

2 Changing the Pre-Intervention Sample (B)

2.1 Changing the pre-intervention sample to 2011Q4-2015Q3

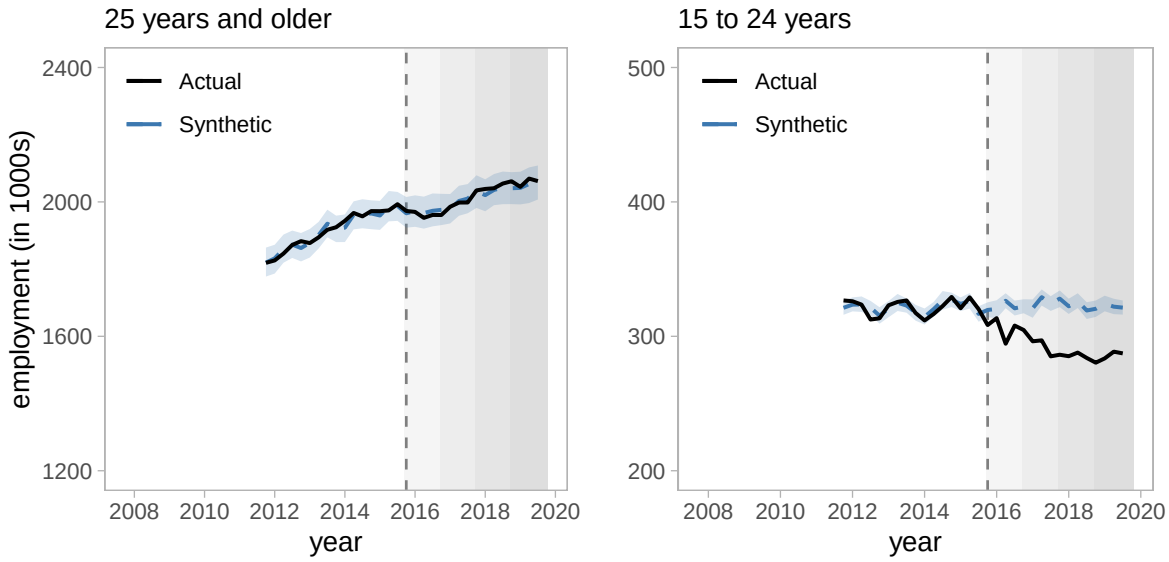

Figure B.1: Changing the pre-intervention sample to 2011Q4-2015Q3 (panel B, by age). Employment effects of Alberta's $15 minimum wage by age groups. Authors' calculations of Labour Force Survey data from Statistics Canada. The solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. The dashed blue lines show synthetic employment levels in Alberta (and 90% posterior probability intervals) without minimum wage changes. Only data before the first minimum wage increase in October 2015 (dashed vertical line) is used to fit the models.

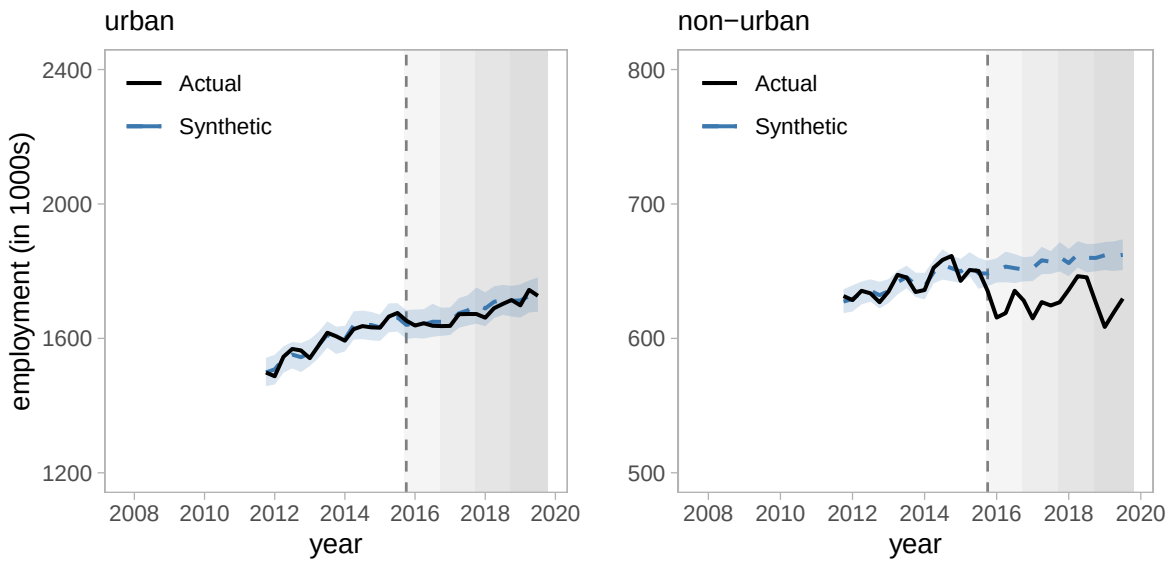

Figure B.2: Changing the pre-intervention sample to 2011Q4-2015Q3 (panel B, by place). Employment effects of Alberta's $15 minimum wage by economic regions. Authors' calculations of Labour Force Survey data from Statistics Canada. The solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. The dashed blue lines show synthetic employment levels in Alberta (and 90% posterior probability intervals) without minimum wage changes. Only data before the first minimum wage increase in October 2015 (dashed vertical line) is used to fit the models.

2.2 Changing the pre-intervention sample to 2003Q4-2015Q3

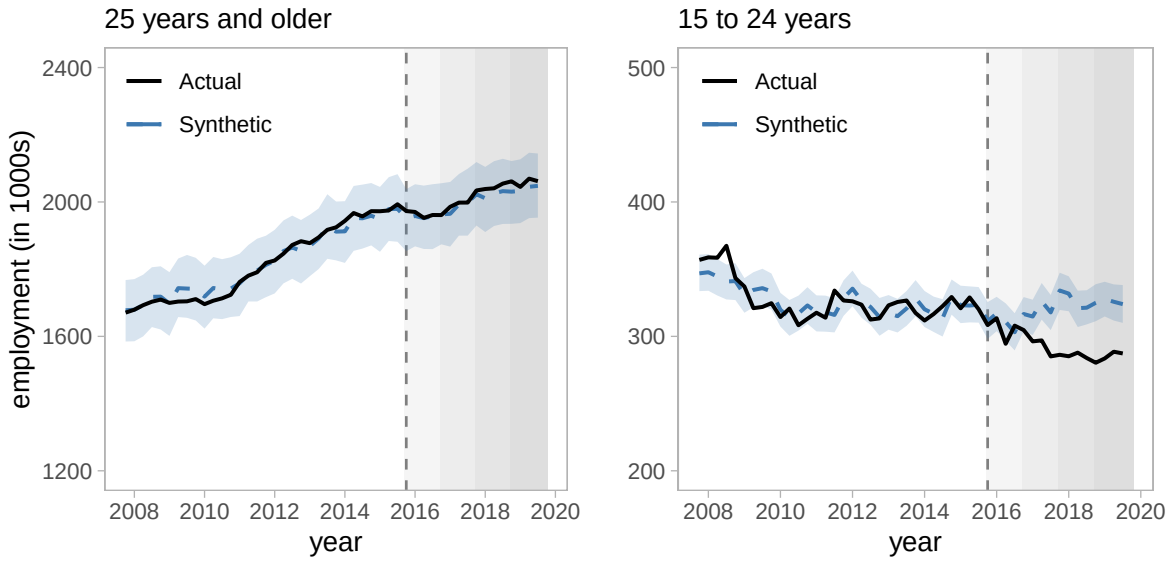

Figure B.3: Changing the pre-intervention sample to 2003Q4-2015Q3 (panel B, by age). Employment effects of Alberta's $15 minimum wage by age groups. Authors' calculations of Labour Force Survey data from Statistics Canada. The solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. The dashed blue lines show synthetic employment levels in Alberta (and 90% posterior probability intervals) without minimum wage changes. Only data before the first minimum wage increase in October 2015 (dashed vertical line) is used to fit the models.

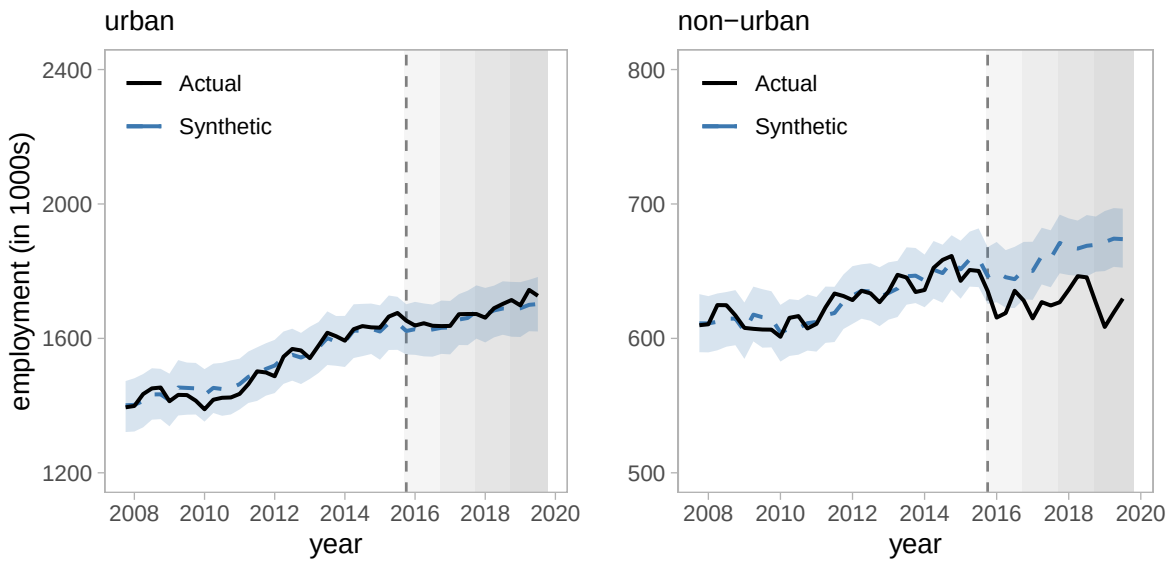

Figure B.4: Changing the pre-intervention sample to 2003Q4-2015Q3 (panel B, by place). Employment effects of Alberta's $15 minimum wage by economic regions. Authors' calculations of Labour Force Survey data from Statistics Canada. The solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. The dashed blue lines show synthetic employment levels in Alberta (and 90% posterior probability intervals) without minimum wage changes. Only data before the first minimum wage increase in October 2015 (dashed vertical line) is used to fit the models.

3 Changing the Donor Pool (C)

3.1 Only Saskatchewan wage bin data

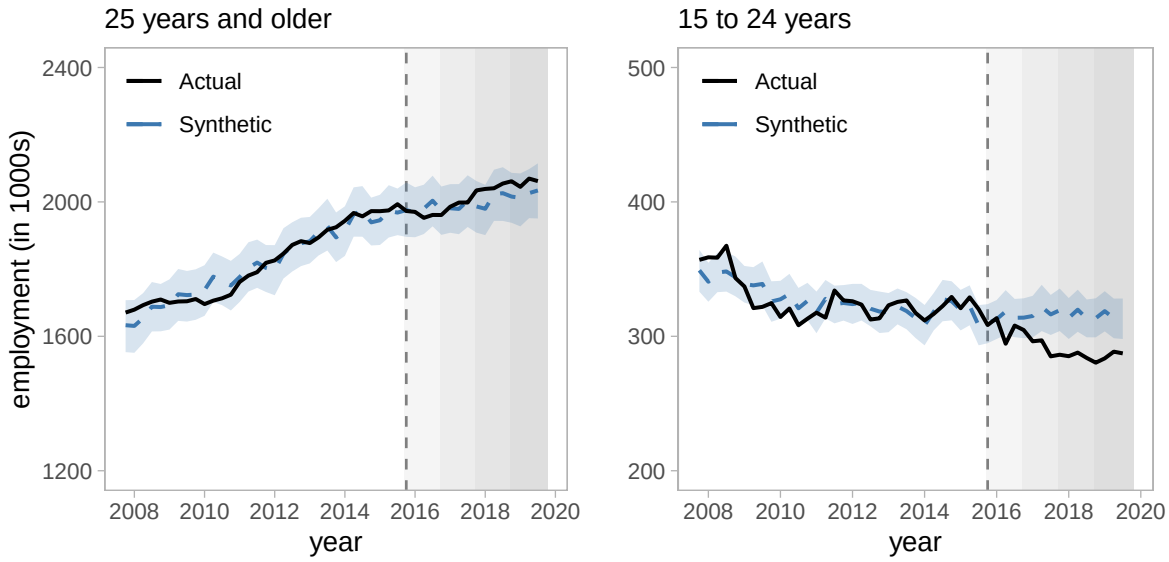

Figure C.1: Only Saskatchewan wage bin data (panel C, by age). Employment effects of Alberta's $15 minimum wage by age groups. Authors' calculations of Labour Force Survey data from Statistics Canada. The solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. The dashed blue lines show synthetic employment levels in Alberta (and 90% posterior probability intervals) without minimum wage changes. Only data before the first minimum wage increase in October 2015 (dashed vertical line) is used to fit the models.

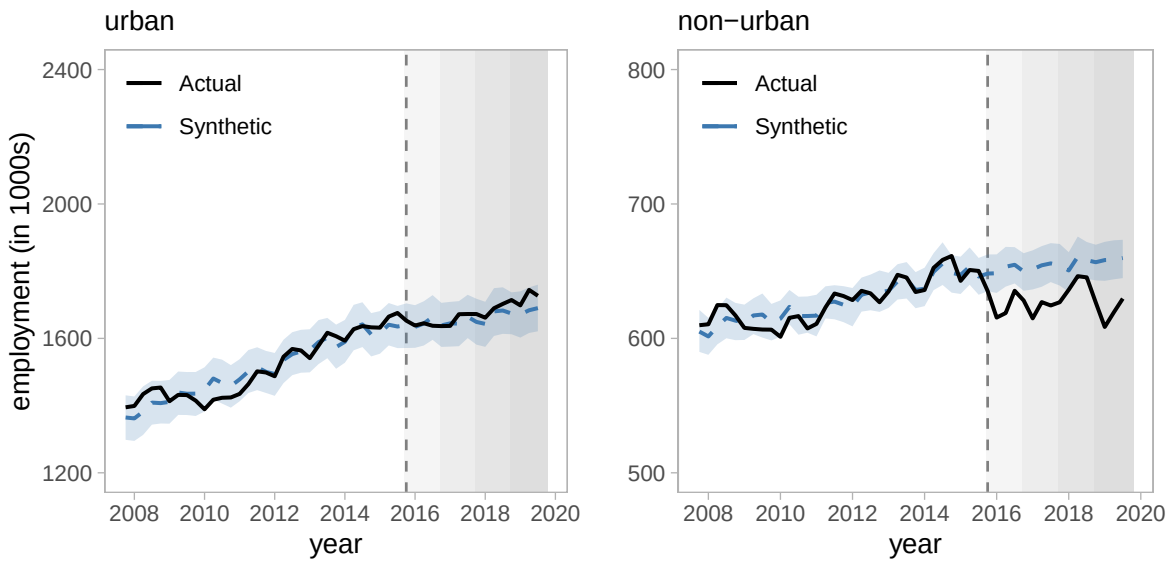

Figure C.2: Only Saskatchewan wage bin data (panel C, by place). Employment effects of Alberta's $15 minimum wage by economic regions. Authors' calculations of Labour Force Survey data from Statistics Canada. The solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. The dashed blue lines show synthetic employment levels in Alberta (and 90% posterior probability intervals) without minimum wage changes. Only data before the first minimum wage increase in October 2015 (dashed vertical line) is used to fit the models.

3.2 Adding British Columbia wage bin data

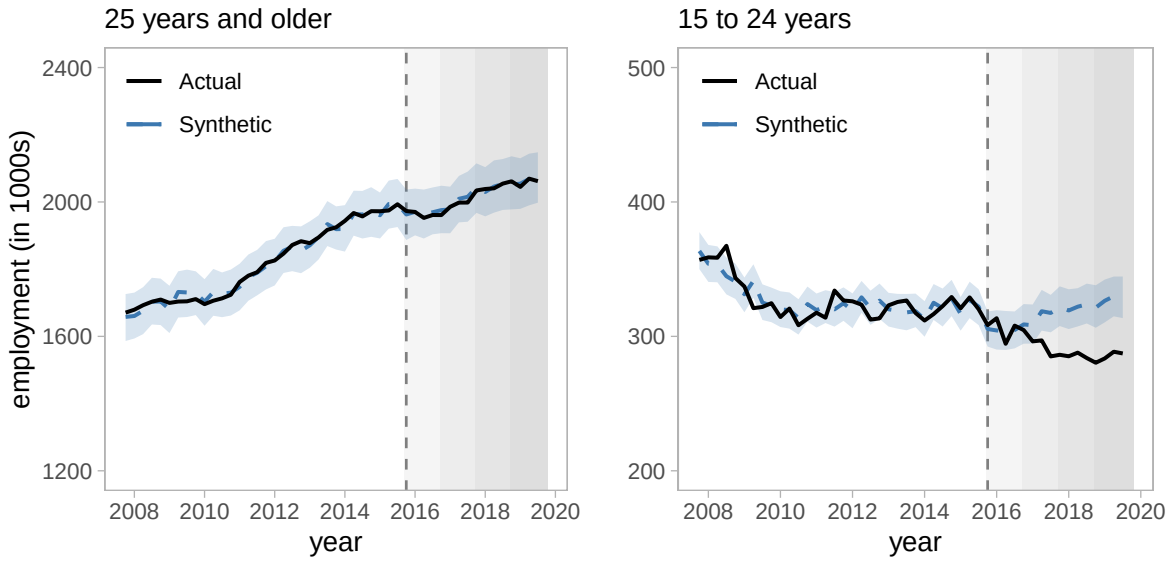

Figure C.3: Adding British Columbia wage bin data (panel C, by age). Employment effects of Alberta's $15 minimum wage by age groups. Authors' calculations of Labour Force Survey data from Statistics Canada. The solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. The dashed blue lines show synthetic employment levels in Alberta (and 90% posterior probability intervals) without minimum wage changes. Only data before the first minimum wage increase in October 2015 (dashed vertical line) is used to fit the models.

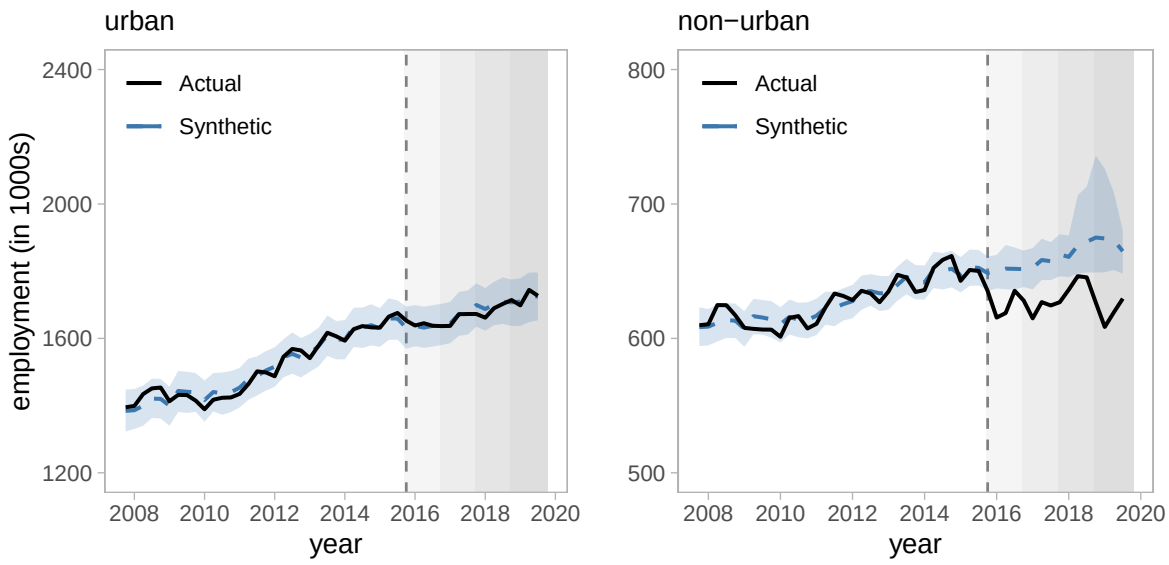

Figure C.4: Adding British Columbia wage bin data (panel C, by place). Employment effects of Alberta's $15 minimum wage by economic regions. Authors' calculations of Labour Force Survey data from Statistics Canada. The solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. The dashed blue lines show synthetic employment levels in Alberta (and 90% posterior probability intervals) without minimum wage changes. Only data before the first minimum wage increase in October 2015 (dashed vertical line) is used to fit the models.

3.3 Using regional data

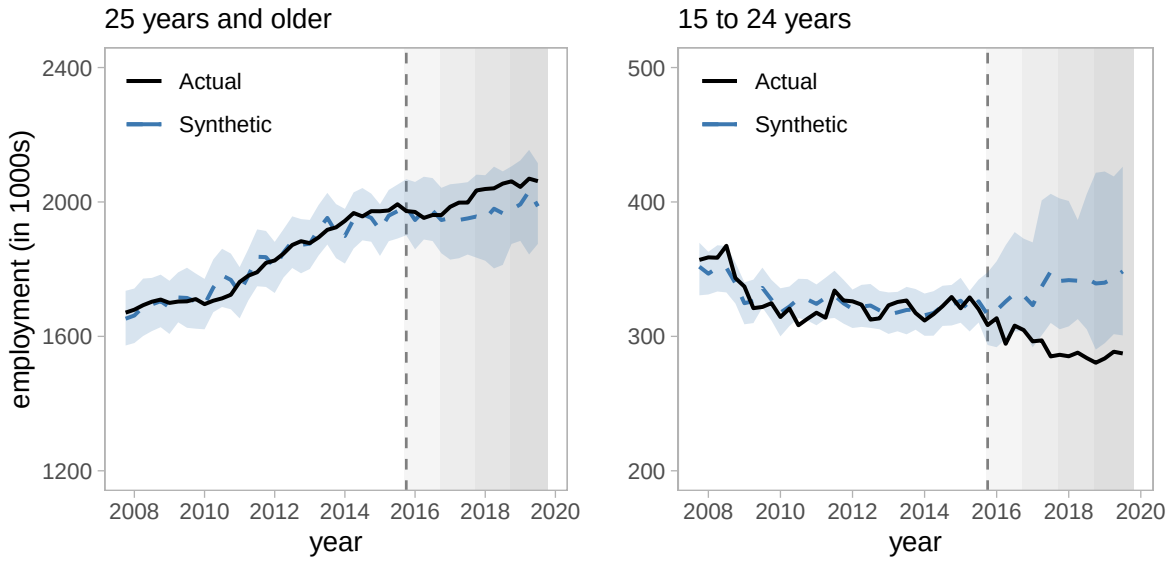

Figure C.5: Using regional data (panel C, by age). Employment effects of Alberta's $15 minimum wage by age groups. Authors' calculations of Labour Force Survey data from Statistics Canada. The solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. The dashed blue lines show synthetic employment levels in Alberta (and 90% posterior probability intervals) without minimum wage changes. Only data before the first minimum wage increase in October 2015 (dashed vertical line) is used to fit the models.

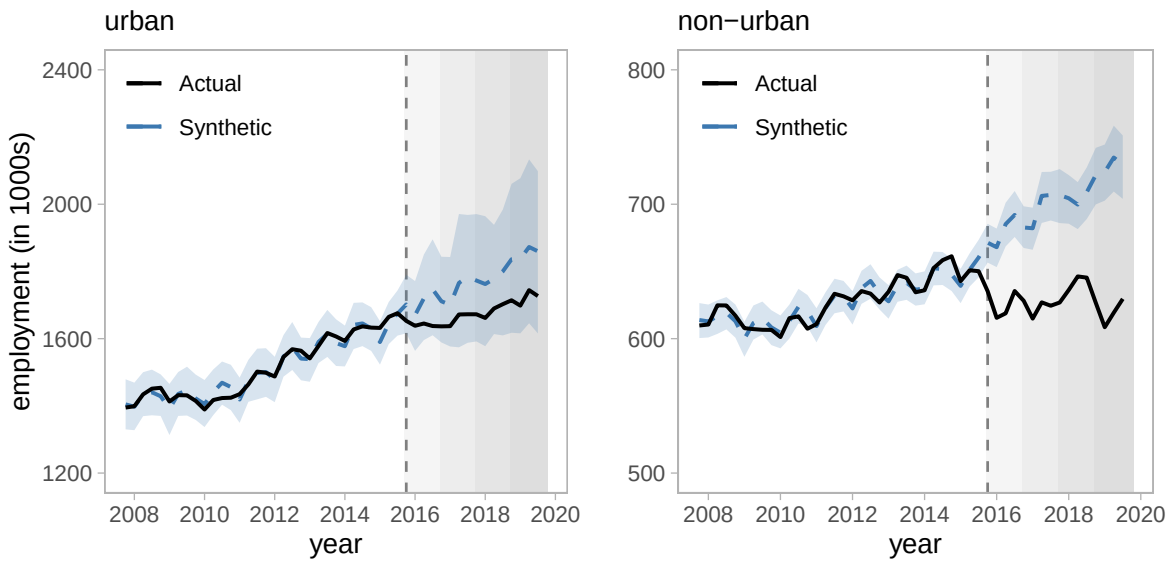

Figure C.6: Using regional data (panel C, by place). Employment effects of Alberta's $15 minimum wage by economic regions. Authors' calculations of Labour Force Survey data from Statistics Canada. The solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. The dashed blue lines show synthetic employment levels in Alberta (and 90% posterior probability intervals) without minimum wage changes. Only data before the first minimum wage increase in October 2015 (dashed vertical line) is used to fit the models.

3.4 Using regional data but excluding Vancouver

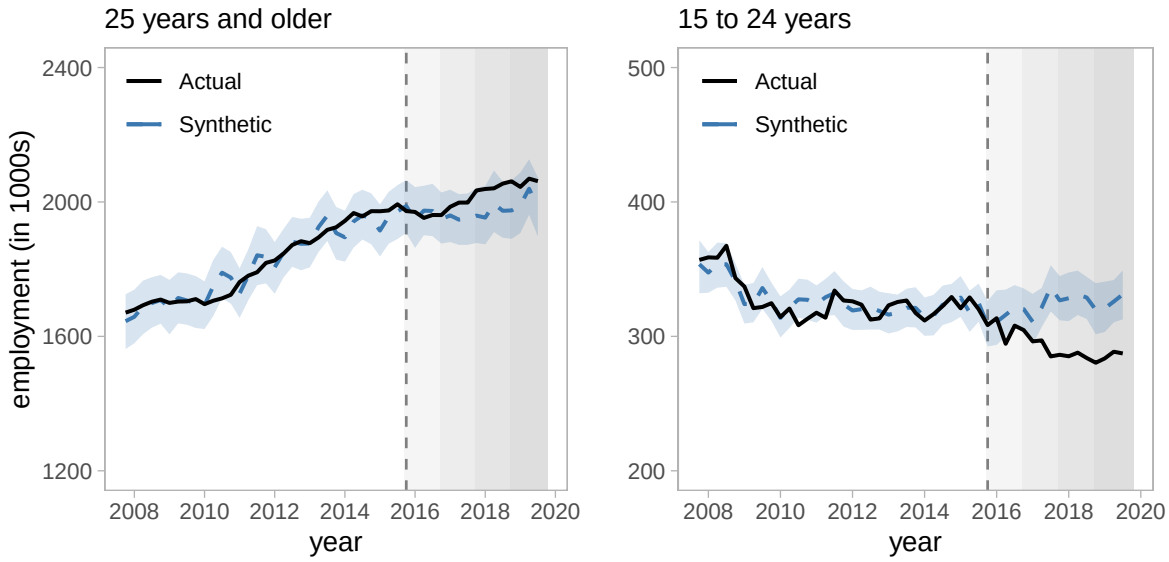

Figure C.7: Using regional data but excluding Vancouver (panel C, by age). Employment effects of Alberta's $15 minimum wage by age groups. Authors' calculations of Labour Force Survey data from Statistics Canada. The solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. The dashed blue lines show synthetic employment levels in Alberta (and 90% posterior probability intervals) without minimum wage changes. Only data before the first minimum wage increase in October 2015 (dashed vertical line) is used to fit the models.

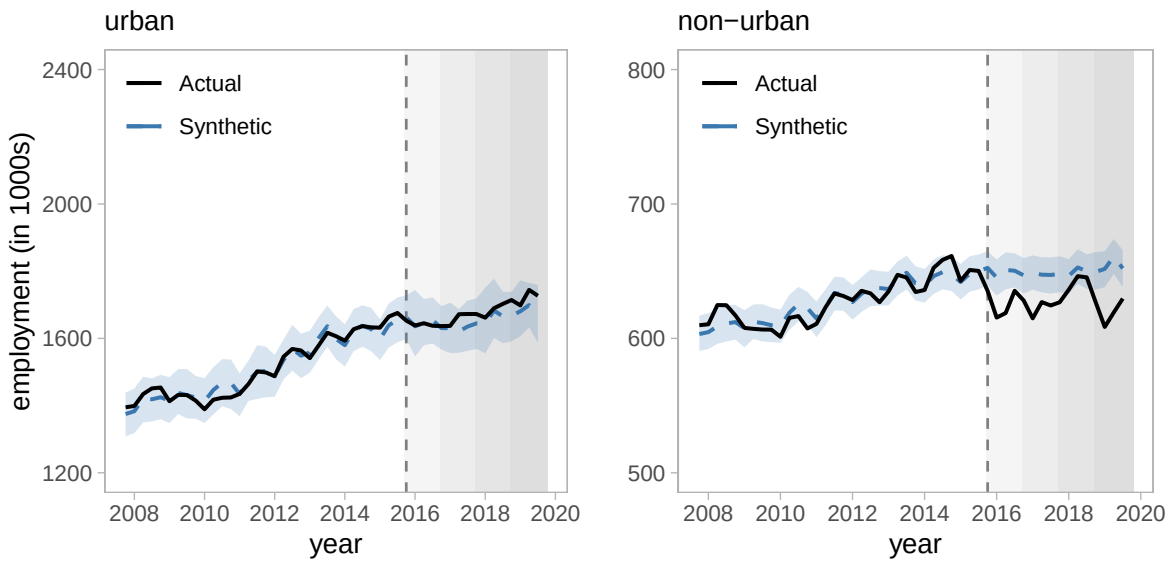

Figure C.8: Using regional data but excluding Vancouver (panel C, by place). Employment effects of Alberta's $15 minimum wage by economic regions. Authors' calculations of Labour Force Survey data from Statistics Canada. The solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. The dashed blue lines show synthetic employment levels in Alberta (and 90% posterior probability intervals) without minimum wage changes. Only data before the first minimum wage increase in October 2015 (dashed vertical line) is used to fit the models.

4 Backdating

4.1 Backdating to 2013Q3 (D)

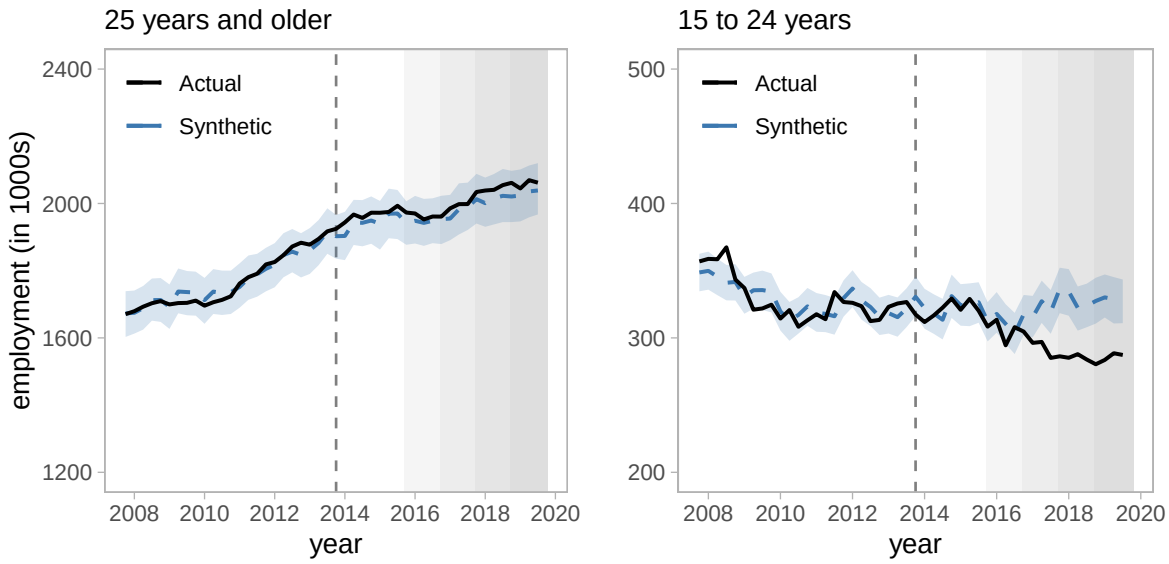

Figure D.1: Backdating to 2013Q3 (panel D, by age). Employment effects of Alberta's $15 minimum wage by age groups. Authors' calculations of Labour Force Survey data from Statistics Canada. The solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. The dashed blue lines show synthetic employment levels in Alberta (and 90% posterior probability intervals) without minimum wage changes. Only data before the first minimum wage increase in October 2015 (dashed vertical line) is used to fit the models.

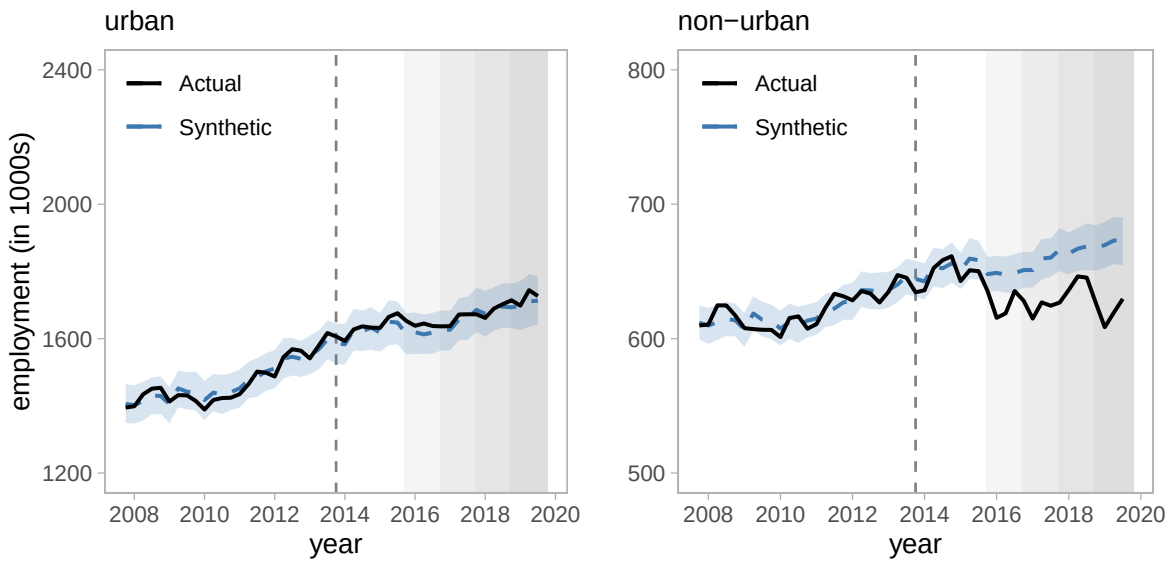

Figure D.2: Backdating to 2013Q3 (panel D, by place). Employment effects of Alberta's $15 minimum wage by economic regions. Authors' calculations of Labour Force Survey data from Statistics Canada. The solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. The dashed blue lines show synthetic employment levels in Alberta (and 90% posterior probability intervals) without minimum wage changes. Only data before the first minimum wage increase in October 2015 (dashed vertical line) is used to fit the models.

4.2 Backdating to 2011Q3 (E)

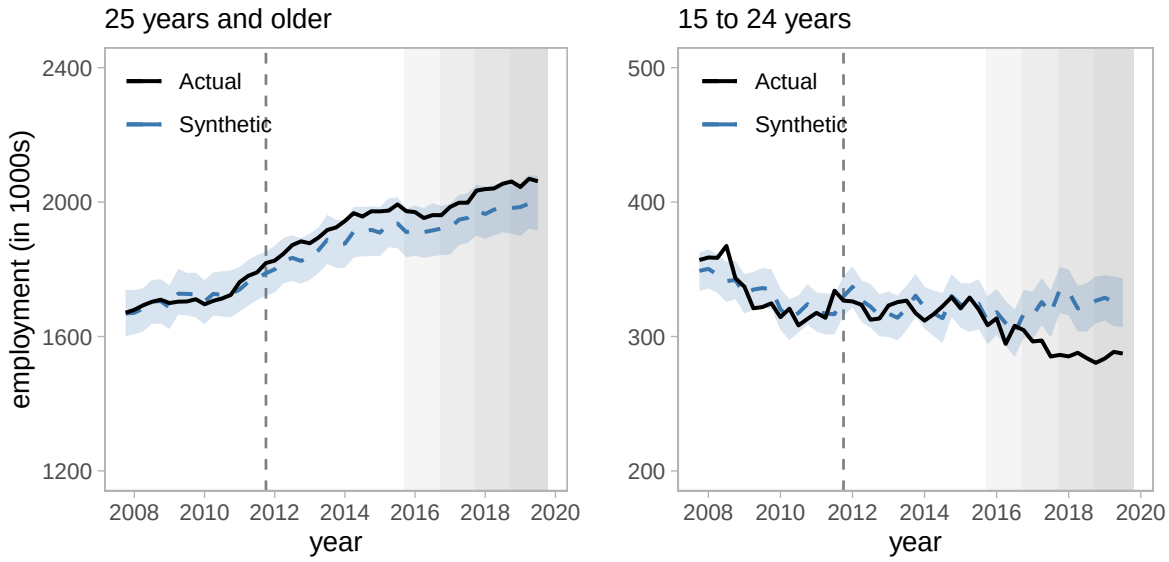

Figure E.1: Backdating to 2011Q3 (panel E, by age). Employment effects of Alberta's $15 minimum wage by age groups. Authors' calculations of Labour Force Survey data from Statistics Canada. The solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. The dashed blue lines show synthetic employment levels in Alberta (and 90% posterior probability intervals) without minimum wage changes. Only data before the first minimum wage increase in October 2015 (dashed vertical line) is used to fit the models.

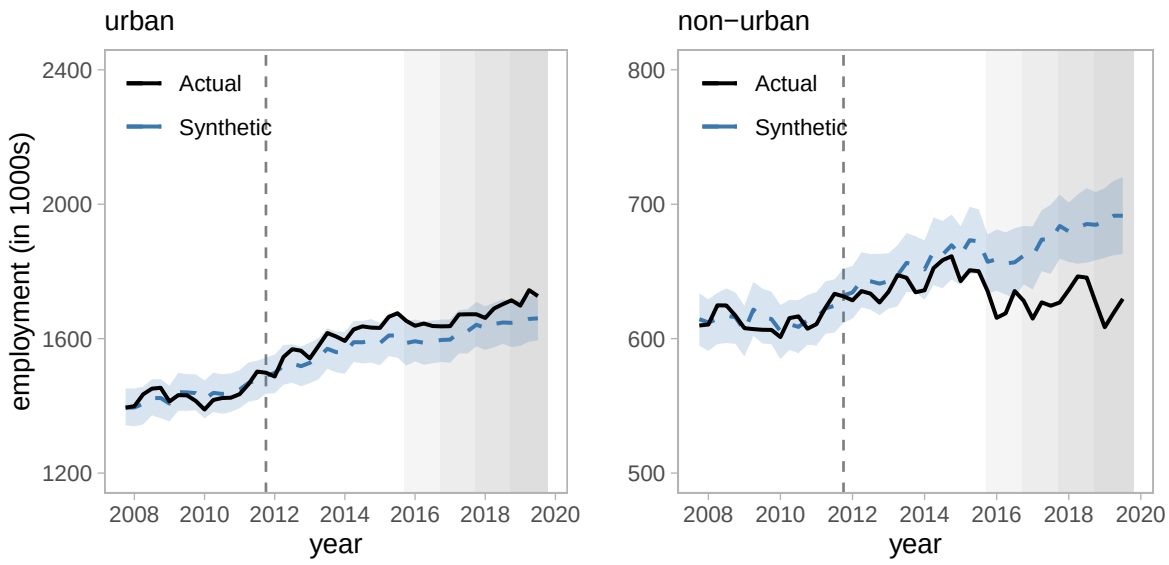

Figure E.2: Backdating to 2011Q3 (panel E, by place). Employment effects of Alberta's $15 minimum wage by economic regions. Authors' calculations of Labour Force Survey data from Statistics Canada. The solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. The dashed blue lines show synthetic employment levels in Alberta (and 90% posterior probability intervals) without minimum wage changes. Only data before the first minimum wage increase in October 2015 (dashed vertical line) is used to fit the models.

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