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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, mostly expected wage changes, spread out over time. A recent set of changes have instead been large, quick, and unexpected, following the "Fight for $15" movement. Alberta is the first North American province, state, or territory to have this $15 minimum wage, with an unexpectedly large increase (47%) occurring over a short time 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, but with a higher distributional reach. Employment losses occurred at similar elasticities, but with large level changes, mostly among younger workers. Newer to the literature, regional employment losses were found in four of the five non-urban economic regions, but not in Alberta's two main cities, showing the significance and nuance of regional heterogeneity.

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1 Introduction

Most empirical studies that comprise the vast minimum wage literature are identified on a large number of small changes to the minimum wage.[1] The reason for this is that most minimum wage policy changes have been relatively small in magnitude, resulting from either being frequently increased nominally by step-wise legislation, or by having a formula in place, where minimum wage increases are automatically tied to inflation through changes in prices and/or earnings. As such, these small changes have also mostly been anticipated over a set period of time, often occurring annually.

In contrast, a recent set of minimum wage changes were instead large in magnitude, with most being motivated by the concept of a nominal $15 minimum wage, despite historical levels well below that mark and significant heterogeneity existing 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 NYC workers an additional six to seven years to reach their goal, this idea quickly spread to other U.S. cities, such as San Francisco and Seattle.[2]

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

[1]The minimum wage literature has so many 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 U.S. minimum wages, see Dube and Lindner (2021). There are currently over 40 localities with minimum wages set above their state level in the U.S.

[3]Due to currency differences, $15 CAD is not exactly equivalent to $15 USD. On October 1st, 2018, $15 CAD was equivalent to roughly $11.71 USD, based on the daily exchange rate of 0.7804. However, the value of $15 CAD was slightly higher when the policy was first proposed in April 2015,

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 since followed Alberta in setting a $15 minimum wage or higher, including: Nunavut in 2020; British Columbia and the Northwest Territories in 2021; California, Ontario, and Yukon in 2022; and Connecticut, Manitoba, Massachusetts, Newfoundland and Labrador, Nova Scotia, Prince Edward Island, Quebec, and Washington in 2023. There are also several $15 minimum wage or higher policies to come: Maryland, New Jersey, New York, and Saskatchewan in 2024; Delaware, Illinois, and Rhode Island in 2025; and Florida, Hawaii, and Virginia in 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.

These new types of policies, with their relatively large minimum wage increases, over an ever expanding geographic reach, offer answers to two main research questions. First, do these new types of large minimum wage changes produce results that are

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 affected groups, their employment elasticities and level changes, and the distributional reach? Second, how are these results similar or different in terms of the expanding geographical reach of the policies, with one common minimum wage level being applied to a host of heterogeneous regions?

In this paper, we evaluate the impacts of Alberta's $15 minimum wage policy on employment by applying a synthetic control approach on aggregate 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 synthetic control techniques. This makes those three studies the closest comparisons to our own, although ours is currently the only study for a state, province, or territory.

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 of a 40 percent change for youth in Denmark, and Gregory and Zierahn (2022) for construction workers in Germany. Therefore, the Alberta case in the current study will serve as the first large minimum wage change for North America, beyond the city level, given that its policy was in place years before the next set of similarly large minimum wage changes at the provincial, state, territorial, and national level. The Alberta case may also stand out as unique by having occurred during a period of lower inflation, while the next set of large changes that followed began during a period of higher inflation.

2 Policies, Data, and Methods

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 minimum wage. 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 scrapped this formulaic approach in 2015, as part of their election platform (Alberta NDP, 2015), with the goal of moving the $10.20 minimum wage to a $15 level by 2018. When Alberta returned to conservative rule in 2019 (under the United Conservative Party), 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 "valid counterfactual control group", there exists a similar or "twin" province of Alberta in Saskatchewan, its neighbor on its eastern side, which continued to follow the same formula-based minimum wage 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 its $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 its formulaic minimum wage approach in 2010, with its first increase in 2011. As of 2014, its minimum wage formula was based equally on changes to AWE and CPI for the previous year, with all changes occurring on October 1st, just like Alberta had. For these reasons, Saskatchewan will be used as the main comparison in the analysis.

Two other provinces can be used for comparison, British Columbia and Ontario, based on also having had formulas and then their own eventual \$15 minimum wage policies, albeit at a much later date. British Columbia, Alberta's other neighboring province on its western side with a similar population size, had a minimum wage indexed to inflation from at least 2015, but they also scrapped their formula later in 2018 to set up their own \$15 path to \$15.20 on June 1st, 2021. Like Saskatchewan, British Columbia will also be used in the analysis, but unlike Saskatchewan, this neighboring province will only be used in the robustness checks.

Ontario is also a province of interest, as its minimum wage was indexed to inflation in 2014, but retroactively done 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 paused there. It then increased to \$14.25 and to \$14.35 on October 1st of 2020 and 2021, respectively, and then to \$15.50 in October 2022. That said, Ontario has a much larger population and much different economy than Alberta. Therefore, Ontario is not used in any part of the analysis, nor are any of the other remaining provinces east of Alberta, due to differences in population sizes, industrial composition, and unemployment rates.

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

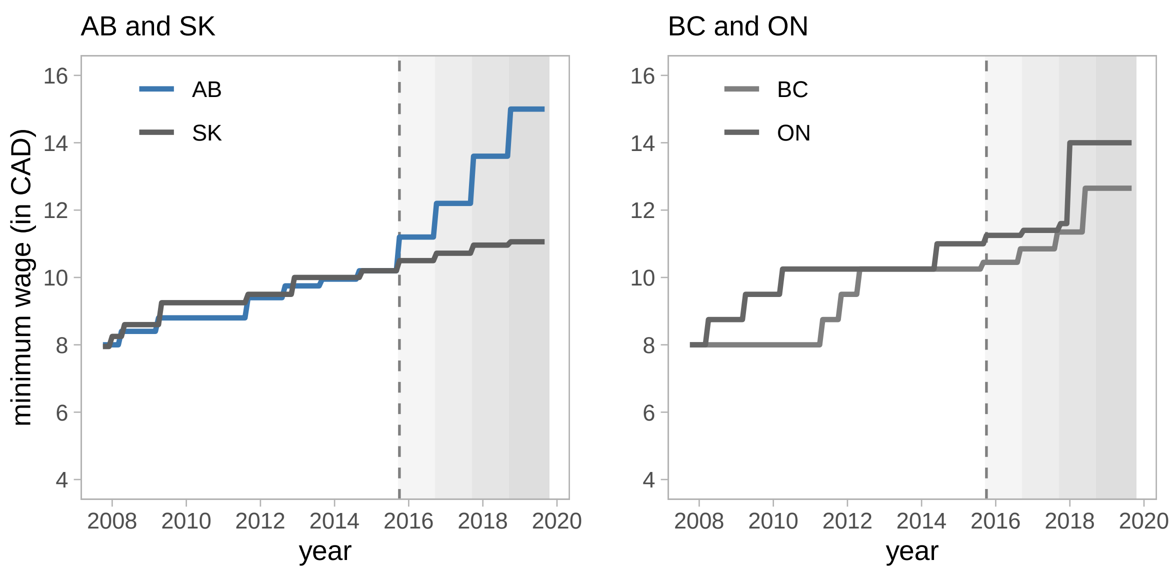

Figure 1: Minimum wages over time in select provinces. Alberta (AB), Saskatchewan (SK), British Columbia (BC), and Ontario (ON). Shaded areas denote four periods of minimum wage increases in Alberta after October 2015 (post-intervention sample): from $10.20 to $11.20 in 2015 Q4, to $12.20 in 2016 Q4,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

2.2 Labour Force Survey Data

For the "sufficiently sharp focus on potentially affected workers" (again from Neumark et al., 2014, p. 610), the order of our data "cuts" follows 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 LFS data by age and region are publicly available from Statistics Canada, using 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, with 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, which began in August 2019, concluded in February 2020, and was publicly released in March 2023 (Marchand et al., 2023).[4]

Our wage and age data cuts 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

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

(20-24), who are 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 of 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 increases, but older workers acts as a placebo, with no expected employment effect.

Our places cut of the data, namely by 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 two urban and five non-urban areas to consider. Cengiz et al. (2022) finds "rural" (i.e., non-urban) to be the fifth most important predictor of being an affected worker of a minimum wage policy. Given their higher price and wage levels, urban areas are therefore seen as placebos a priori. However, mostly lower-priced, non-urban areas are expected to show some negative employment effects after the minimum wage increases.

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

2.3 Synthetic Control Methods

A synthetic control approach is used for our identification strategy, in order 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. The reasons for this approach are laid out by Abadie et al. (2010) and Abadie (2021), who state the improvements over the other techniques applied in the literature. To our knowledge, 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).

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 using aggregate data. 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:

(1) $$Y_{0t} = \alpha_t + \sum_{j=1}^{J} \beta_j Y_{jt} + \sum_{q=2}^{4} \delta_q Q_{qt} + \varepsilon_t$$

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

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 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:

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

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 39 counties within Washington state 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, for the differences in population, industry mix, and unemployment rates, as already stated earlier in subsection 2.1.

In particular, we need to identify labor markets unexposed to large minimum wage increases, but that were exposed to Alberta's general labor market trends, such as its labor demand being tied to energy prices (see, e.g., Marchand, 2012, 2015, 2020).[5] 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 for slicing 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 is not affected by minimum wage increases in Alberta, as they are far from the restriction and, simultaneously, will capture the time-varying Alberta factors better than the Saskatchewan data. We

[5]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).

evaluate the validity of this assumption in the robustness section.

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 (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). For each synthetic control, we report the variable importance plots, which show how important each untreated unit is in the model. In each case, the Gibbs sampler is run 1,000 times.

3 Employment Effects of a $15 Minimum Wage

3.1 By Wages: Workers Moved Up Bins

Our first cut of the Labour Force Survey data by wages is our first attempt to answer our first main research question: Do these new types of policies, with large minimum wage increases, offer results that are similar or different to the existing literature? Previous studies have focused on employment movements in and out of wage bins near, but typically exactly at or above, the targeted minimum wage of the policy, such as Jales (2018) for Brazil and Cengiz et al. (2019) for the U.S. In our wage cut, we 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.

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, due to having received a hourly wage raise, and so on. Once again, the series of wage bins that correspond with the 2015-2018 increases in the minimum wage in Alberta are: 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 show this effect the simplest way in Figure 2, by looking at employment in two aggregate wage bins: the \$11.20 and below bin, shown in the top panel, and a mixture of the \$11.20 to \$13.60 bins, shown in the bottom panel. Employment in the \$11.20 and below bin should decrease as soon as that \$11.20 increment is hit. However, the middle two incremental bins, from \$11.20 to \$13.60, should show an employment increase and then decrease accordingly. In both cases, employment series for actual Alberta (with the policy) and synthetic Alberta (counterfactual without the policy) behave similarly up to the policy, until just before the first minimum wage increase to \$11.20 occurs.[6]

After October 2015, the trend lines begin to diverge significantly in Figure 2, as expected. In the case of the \$11.20 and below bin, actual employment levels are below that of the synthetic control almost immediately, as workers start moving out of this wage bin toward 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 more workers suddenly appear in these middle wage bins during the first two minimum wage increases. But, as the minimum wage increased to \$13.60, and then higher to \$15.00, most workers

[6]For the \$11.20 and below bin, our model identifies Saskatchewan employment for the \$10.20 or less 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 of appearing in the synthetic control regression. In contrast, for the \$11.20 to \$13.60 bin, the synthetic control is constructed using the local level term and quarterly seasonal dummy variables. See Figure A.1.1 of the Appendix.

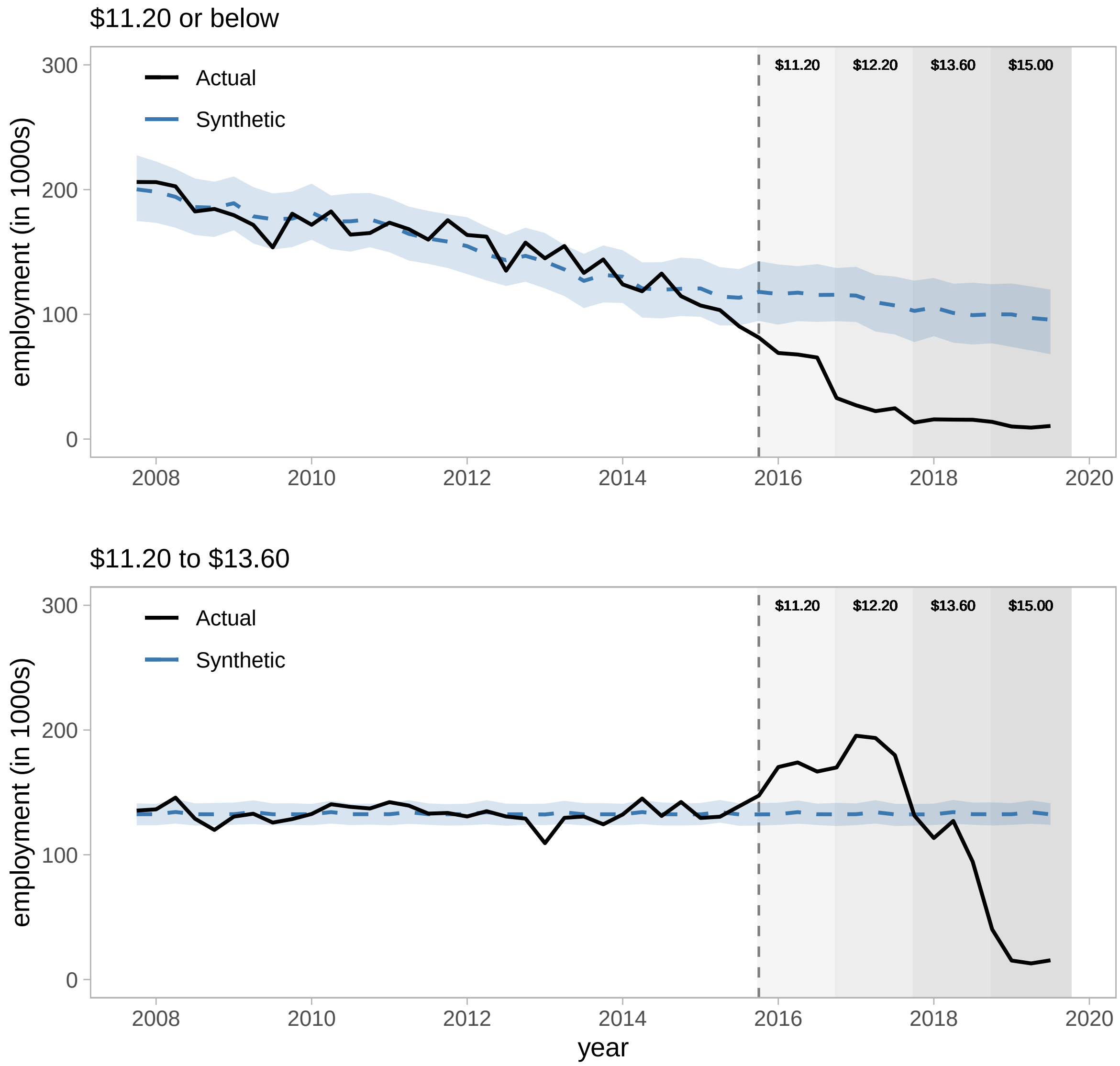

Figure 2: Employment effects of Alberta's $15 minimum wage by wage bins. Authors' calculations of Labour Force Survey data from Statistics Canada. Solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. Dashed blue lines show synthetic employment 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.

then moved out of those wage bins, again toward zero. Although we only show the middle bin results for brevity, we also did this analysis separately for each incremental wage bin (see Figure A.2.1 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, 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, the reach of the $15 minimum wage policy was just past the 15th percentile (15.86) of the wage distribution. This is remarkably high for Canada, given that Campolieti (2015) previously found a lower distributional reach of the 5th percentile for men and the 10th percentile for women. For the U.S., however, it is within range, as Autor et al. (2016) found impacts as high as the 10th percentile for men and the 25th percentile for women.

Table 1: Employment descriptive statistics by wage bins.

	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.

3.2 By Ages: Youth Lost Employment

Our second cut of the LFS data by ages continues to answer 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? Cengiz et al. (2022) showed age to be the strongest predictor of being an affected worker due to a minimum wage policy, and the minimum wage literature points to negative, but relatively small, employment effects resulting from minimum wage increases, typically for teenagers and younger adults.[7] In this age cut, we want to know whether the affected age groups align with the previous literature, how our employment elasticities and level changes relate to that of the previous literature, and whether any potential job loss from this policy was predictable.

The sign and significance of the employment effects of Alberta's $15 policy are displayed by age group in Figure 3. The top panel shows the actual and synthetic employment levels for individuals aged 25 years and older, which behave similarly over our sample, with no significant job losses for older individuals due to the minimum wage increases. The bottom panel displays the employment of younger individuals aged 15 to 24. In this case, the actual and synthetic series behave similarly through September 2016, so no job losses occur from the first minimum wage increase to $11.20. However, after the second increase to $12.20 in October 2016, the employment series diverge, with the actual employment level statistically below those of the synthetic control until the end of our sample, reflecting job losses only for younger workers.

Most often in the literature, the size of the employment effect of a minimum wage policy takes the form of an elasticity between the changes in the real minimum wage and youth employment. 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 real minimum wage reduces the affected employment by 1 to 3 percent, but Brown (1999) then put that number closer

[7] Again, 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).

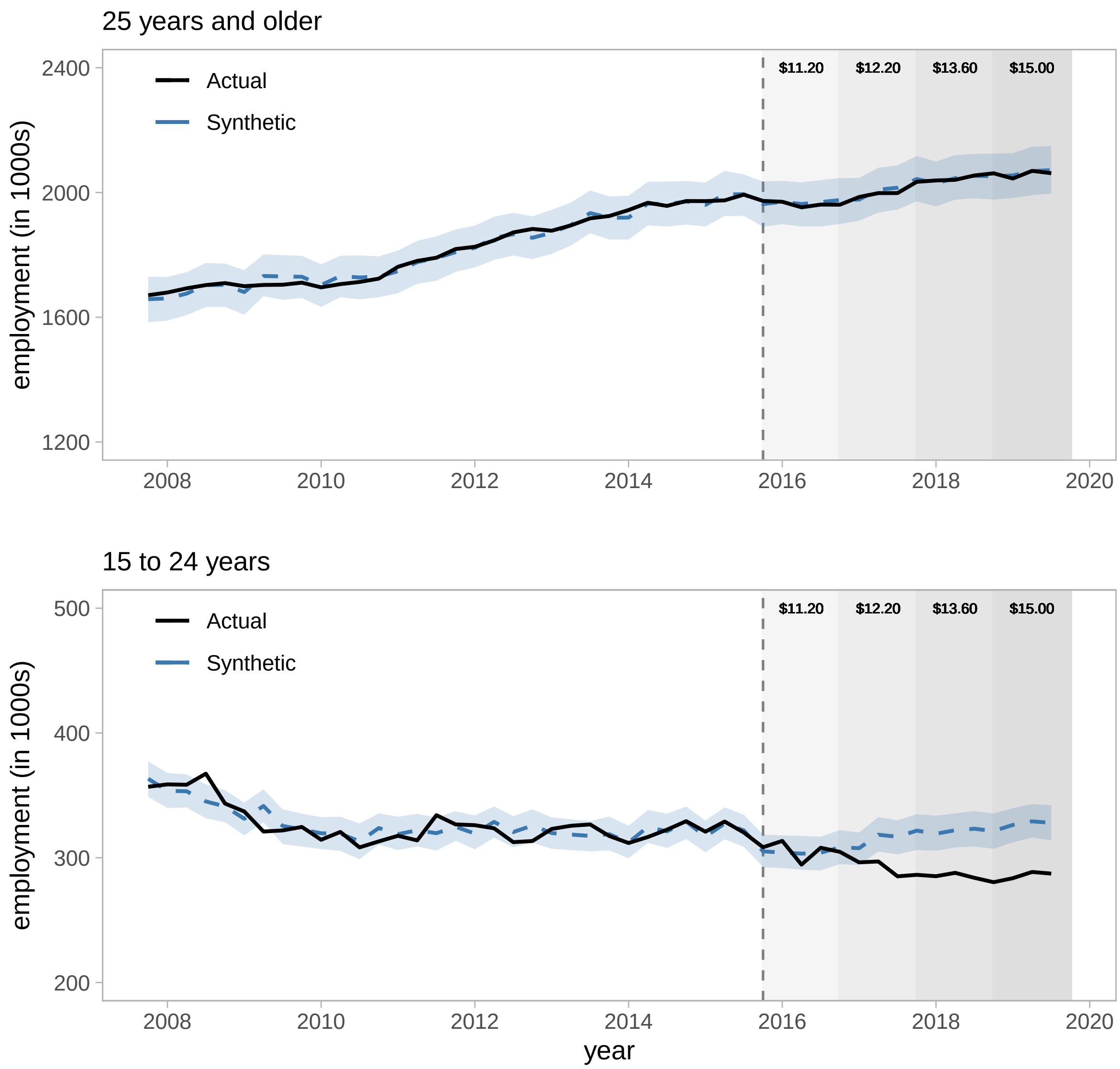

Figure 3: Employment effects of Alberta's \$15 minimum wage by age groups. Authors' calculations of Labour Force Survey data from Statistics Canada. Solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. Dashed blue lines show synthetic 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.

to the lower bound of -0.1. For Canada, these elasticity estimates are typically larger than for the U.S., ranging from -0.17 to -0.75 (Marchand, 2017), with a recent meta-analysis of Canadian studies finding an elasticity of about -0.27 (Campolieti, 2020).

Back-of-the-envelope employment level predictions using these previous elasticities for British Columbia (Green, 2015) and Alberta (Marchand, 2017), which had similarly sized labor forces, suggested employment losses of around 25,000 young workers from their proposed $15 minimum wage policies.

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 again find no evidence of employment losses for older workers. In contrast, we find a significant employment loss for younger individuals of 7 percent, relative to their third quarter 2015 employment level. This implies an employment elasticity of -0.15 and an average employment level loss of 23,012 jobs for younger individuals due to the minimum wage increases. We additionally find similar employment effects for teenagers, aged 15 to 19, and younger adults, aged 20 to 24, when analyzed separately (see Figure A.3.1 of the Appendix), while the literature typically shows larger effects for teens.

Could these employment changes from the minimum wage have been predicted ahead of time? The minimum-to-median wage ratio, also known as the Kaitz index, offers some insight as to where these negative employment effects may become significant. Fortin (2010) suggested that employment loss from a minimum wage begins to occur with a *pre*-reform Kaitz index above 45 percent in the context of the Canadian province of Quebec, and Cengiz et al. (2019) recently showed U.S. evidence that this pre-reform threshold may be as high as 60 percent. Gregory and Zierahn (2022) re-

[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. See Figure A.1.2 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	0.03	0.01
prob.	0.41	0.00	0.01	0.00
employment	-3,545	-23,012	-7,121	-13,638
elasticity	-0.00	-0.15	-0.15	-0.13

Notes: Top panel reports posterior mean treatment effects as fraction of 2015 Q3 employment (effect), posterior standard deviations (std. dev.), and posterior tail-probabilities of no effect (prob.). 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.

ported a *post*-reform Kaitz index close to 100 percent for a particular large minimum wage increase among construction workers in Germany.

The average, median, and minimum wage rates, as well as the Kaitz indices, are shown by age group for Alberta and Saskatchewan in Table 3. In October 2014, the year before Alberta's $15 minimum wage policy, the nominal minimum wage in both provinces was $10.20, and the Kaitz index was around 40 percent for older workers (aged 25-64). This ratio for younger workers (15-24) was already over 60 percent in both provinces at that time. By October 2018, when Alberta's $15 minimum wage was fully in place, the nominal minimum wage in Saskatchewan was only $11.06. As a result, the minimum-to-median wage ratio in Alberta increased to over 50 percent for prime-age (25-54) and older (55-64) workers, and it was as high as 92 percent for young workers. In contrast, the Kaitz indices remained mostly unchanged in Saskatchewan in the post-intervention sample.

Table 3: Wage descriptive statistics by province and 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
Kaitz index	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
Kaitz index	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. While all three cuts help answer the first research question, the place cut also helps us specifically answer our second main research question: How are these results similar or different in terms of the expanding geographical reach of the policies? This follows the suggestion for a more local approach to measuring minimum wage effects (Thompson, 2009; Dube et al., 2010), and the finding of "rural" (i.e., non-urban) as the fifth most important predictor to being an affected worker by a minimum wage (Cengiz et al., 2022).[9] In this place cut, we begin with a comparison of urban versus non-urban employment changes, in light of the previous literature and our age results, and then include more nuance,

[9]The border approach, made popular by Dube et al. (2010), cannot be done for Canadian studies of the minimum wage, due to Canada having fewer provinces and territories (13) then U.S. states (50), a smaller population than the U.S. (of roughly 11.5 percent), and fewer local labor markets or notable populated areas along its borders. One large urban area, Ottawa and Gatineau, between Ontario and Quebec, is the most notable example, whereas Lloydminster (roughly 30,000 in population) is likely the best example along the Alberta-Saskatchewan border.

by showing cross-tabulations of place and age, breakouts for each Alberta economic region, and the Kaitz indices by region.

When one common minimum wage level is applied to a host of heterogeneous regions, large urban areas might better 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 followed this logic, from New York City, to its suburbs, and then on to the rest of the state. Azar et al. (2019) also 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; the more concentrated it is, like in heavily urbanized areas, the less negative the effects are, to the point that they may turn positive in the most concentrated labor markets.

The sign and significance of the employment effects from Alberta's $15 policy are presented by region type in Figure 4.[10] The top panel shows the urban regions, where the actual and synthetic employment series behave similarly until the end of our sample. As a result, we do not observe significant job losses due to the minimum wage in urban areas, as predicted. For the non-urban regions in the bottom panel, the actual and synthetic series behave similarly until September 2015, when the first minimum wage increase to $11.20 was implemented. After October 2015, these series diverge, and the actual employment levels are below those of the synthetic control, displaying significant job loss in non-urban areas, again as predicted.

The magnitude of the employment effects of Alberta's policy are summarized by place and age in Table 4, again reporting the posterior mean treatment effect, its

[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. See Figure A.1.3 of the Appendix.

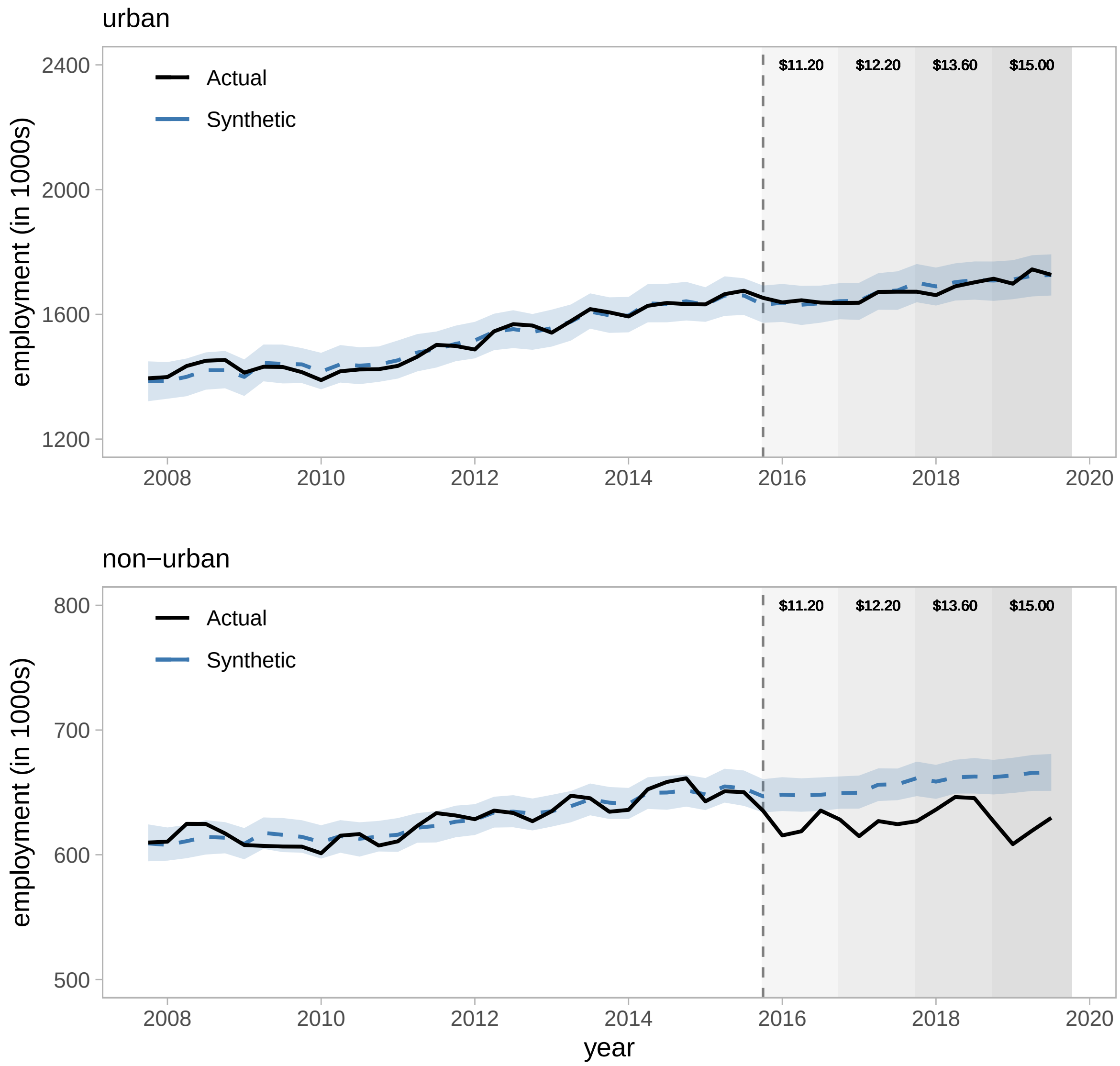

Figure 4: Employment effects of Alberta's $15 minimum wage by economic regions. Authors' calculations of Labour Force Survey data from Statistics Canada. Solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. Dashed blue lines show synthetic 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.

standard deviation, and the posterior tail-probability of no effect. As expected, we find no evidence of employment losses for urban workers. In contrast, we find a significant loss of employment for non-urban workers of 4 percent, relative to their third quarter

2015 employment level, implying an employment elasticity of -0.09 and an average loss of 29,136 jobs for this group. 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. There is, however, no evidence of employment loss for older workers in urban areas. In contrast, we find a significant loss of employment of 8 percent for younger workers (aged 15-24) for both urban and non-urban workers (see Figures A.4.1 and A.4.2 of the Appendix).

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

	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.	0.45	0.13	0.00	0.00	0.00	0.00
employment	-2,528	17,837	-17,667	-29,136	-21,859	-8,021
elasticity	-0.00	0.02	-0.17	-0.09	-0.09	-0.17

Notes: Top panel reports posterior mean treatment effects as fraction of 2015 Q3 employment (effect), posterior standard deviations (std. dev.), and posterior tail-probabilities of no effect (prob.). 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.

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 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 (see Reich et al., 2017; Jardim et al., 2022). While the Seattle studies allowed 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, province, or territory, as provided by our Alberta 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 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).[11] The results, summarized in Table 5, show no significant employment losses in either major city of Calgary (R2) or Edmonton (R4), consistent with our results for urban workers. In contrast, four of our five non-urban regions exhibited significant employment losses ranging from 5 to 7 percent, with elasticities between -0.11 and -0.15, remarkably similar to our age results.[12] That said, the non-urban area of Lethbridge (R5) showed a small employment gain of 2 percent, although it was not statistically significant.

Again, one way to anticipate the relative employment impacts of a minimum wage policy across different geographies is to use the ratio of the minimum-to-median wage for each area, or the Kaitz index. Table 6 presents the average, median, and minimum wage rates, as well as Kaitz indices, for each of Alberta's seven 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 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, and $28.91). The pre-reform Kaitz index was around 40 percent in all seven economic

[11]In using LFS economic regions rather than Census divisions, we offer a more aggregated approach than other previous local labor market analyses for Western Canada (Marchand, 2012, 2015, 2020).

[12]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.

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	0.40	0.00	0.00	0.06	0.00	0.00
employment	-619	-2,144	-11,761	-8,074	2,951	-6,456	-5,041
elasticity	-0.00	-0.00	-0.13	-0.15	0.04	-0.11	-0.13

Notes: Top panel reports posterior mean treatment effects as fraction of 2015 Q3 employment (effect), posterior standard deviations (std. dev.), and posterior tail-probabilities of no effect (prob.). 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).

regions in October 2014. By October 2018, however, the post-reform Kaitz index in Alberta's urban regions increased to over 50 percent, 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 across our three cuts of data. 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 following the various suggested ways of doing robustness checks by Samartsidis et al. (2019) and Abadie (2021).

First, we use a different time horizon in estimating the models, as shown in Panel B of Table 7 (and Figures B.1.1 to B.2.4 of the Appendix). Our main results, shown in

Table 6: Wage descriptive statistics by economic regions.

	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
Kaitz index	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
Kaitz index	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).

Panel A, used an eight-year sample (2007 Q4 - 2015 Q3) of pre-intervention data. We now report the results obtained using four years (2011 Q4 - 2015 Q3) and twelve years (2003 Q4 - 2015 Q3). In both cases, the results are consistent, as we find a significant loss of employment, with a slightly higher 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.

Second, we alter the selection of untreated units used to construct the synthetic controls, as shown in Panel C of Table 7 (and Figures C.1.1 to C.4.4 of the Appendix). We make the following changes to the donor pool: (i) drop Alberta employment data and only use Saskatchewan data; (ii) add British Columbia employment data sliced by wage bins just like the Saskatchewan data; (iii) slice British Columbia and Saskatchewan employment data by economic regions instead of wage bins and, (iv) slice British Columbia

Table 7: Employment effects under different specifications by age and place.

	by age		by place	
	25+	15-24	urban	non-urban
A: Main results				
As fraction of 2015 Q3 employment	-0.00	-0.07	-0.00	-0.04
B: Changing the pre-intervention sample				
2011 Q4 - 2015 Q3 (4 years)	0.00	-0.09	-0.00	-0.05
2003 Q4 - 2015 Q3 (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	-0.12	-0.06	-0.11
Using regional data (excl. Vancouver)	0.02	-0.09	0.01	-0.03
D: Backdating to 2013Q3				
2013 Q4 - 2015 Q3 (in-time placebo test)	0.01	-0.01	0.01	-0.01
2015 Q4 - 2019 Q3 (intervention)	0.01	-0.09	0.01	-0.05
E: Backdating to 2011Q3				
2011 Q4 - 2015 Q3 (in-time placebo test)	0.02	0.00	0.02	-0.02
2015 Q4 - 2019 Q3 (intervention)	0.03	-0.09	0.03	-0.07

Notes: Synthetic control specifications for all robustness exercises are reported in Table A.1 of the Appendix.

and Saskatchewan employment data by economic regions, but exclude the Vancouver economic region, as there is no equivalently large Alberta city. 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.

Third, we backdate the timing of the intervention by two years (to 2013 Q3) and four years (to 2011 Q3), as shown in Panels D and E of Table 7 (and Figures D.1.1 to E.1.4 of the Appendix). As discussed in Abadie et al. (2015) and Abadie (2021), this is, effectively, an in-time placebo test, meaning we should not find effects prior to the actual intervention date. These 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 by longer.

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 third quarter 2015 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 third quarter 2015 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 is mostly comprised of estimates 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 the initial price and wage levels. As the first province, state, or territory 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.

In order to say anything normative about these new types of minimum wage policies, we must first be able to say something positive through empirical investigation. To do this, our study examined the impacts of Alberta's $15 minimum wage policy on employment using synthetic control methods applied to aggregate Labour Force Survey data from Statistics Canada. For our counterfactual, we mostly compare Alberta, with its new and unexpected policy, to its 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 cuts tying mainly to the broader literature and the third cut mostly serving as a more unique contribution.

Our first main research question was whether these new types of policies, containing large minimum wage increases, offer results that are similar or different to the existing literature, which was based on the previous smaller minimum wage increases. Perhaps surprisingly, the new evidence shares a lot of similarities with the old evidence. To start, a significant number of workers moved up the wage distribution, according to each incremental increase, as the raised minimum wage is no longer allowing employment in those lower bins, validating our method. That said, not all of the workers from the lower wage bins made appearances in the higher wage bins during these movements. Employment losses were found among the young and outside of urban areas, which were in part predictable based on their initial Kaitz indices. But those losses also came with the same implied employment elasticities in the previous literature between -0.10 to -0.15.

There were differences, however, between our evidence for this large minimum wage increase for Alberta and that of the smaller minimum wage increases of the literature. First, the distributional reach of this policy was unsurprisingly higher, up to the 15th percentile, than that of the Canadian literature, previously ranging from the 5th to 10th percentiles. Second, although the employment elasticities were the same, the employment level losses were larger for the new policy, because the same elasticity multiplied by a larger minimum wage change will mechanically result in larger level changes. Third, the employment effect was consistent across teens (15 to 19) and slightly older workers (20 to 24), which is not always the case in the literature. Lastly, although affected groups were predictable, not all were tested, and predictions based on the Kaitz index were consistent, but did not always hold.

Our second main research question was whether our results are similar or different in terms of the expanding geographic reach of the policy, as one wage is being applied to places with different price levels. This is a relatively new contribution. When the impacts are examined by region, employment losses were found for four of the five non-urban regions, whereas employment losses in the two urban areas were insignificant. As stated above, the magnitudes and elasticities are remarkably consistent in terms of affected ages and places. Therefore, we find geography to be as equally as important as age as a factor for determining the affected individuals of a minimum wage policy. When mixing place and age, youth losses and older employment gains almost equally offset each other in urban areas. And once again, the Kaitz index showed where employment losses would occur, with some exceptions.

The main takeaways 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 within non-urban regions, with their lower relative price and wage levels. But despite how large, quick, and unexpected the increases were, the employment elasticities were almost exactly in line with the literature. In addition, heterogeneity matters when applying one wage level to a variety of places, but there is also some nuance and not all predictions hold. 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, albeit in a time of lower inflation. However, the more heterogeneous the localities within that future geographic policy reach, the more nuance and uncertainty will be introduced.

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

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Online Appendix

This version: July 25, 2023

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Table A.1: Synthetic control specifications.

	training sample	evaluation sample	untreated units
A: Main results	2007Q4 - 2015Q3	2015Q4 - 2019Q3	AB wage bins: \$20.00 or above SK wage bins: \$10.20 or below, \$10.20 to \$11.20, \$11.20 to \$12.20, \$12.20 to \$13.60, \$13.60 to \$15.00, \$15.00 to \$20.00, \$20.00 or above
B: Changing the pre-intervention sample			
B.1: 4 years	2011Q4 - 2015Q3	2015Q4 - 2019Q3	same as **A**
B.2: 12 years	2003Q4 - 2015Q3	2015Q4 - 2019Q3	same as **A**
C: Changing the donor pool			
C.1: Only SK wage bin data	2007Q4 - 2015Q3	2015Q4 - 2019Q3	SK wage bins: \$10.20 or below, \$10.20 to \$11.20, \$11.20 to \$12.20, \$12.20 to \$13.60, \$13.60 to \$15.00, \$15.00 to \$20.00, \$20.00 or above
C.2: Adding BC wage bin data	2007Q4 - 2015Q3	2015Q4 - 2019Q3	AB wage bins: \$20.00 or above BC wage bins: \$10.20 or below, \$10.20 to \$11.20, \$11.20 to \$12.20, \$12.20 to \$13.60, \$13.60 to \$15.00, \$15.00 to \$20.00, \$20.00 or above SK wage bins: \$10.20 or below, \$10.20 to \$11.20, \$11.20 to \$12.20, \$12.20 to \$13.60, \$13.60 to \$15.00, \$15.00 to \$20.00, \$20.00 or above
C.3: Using regional data	2007Q4 - 2015Q3	2015Q4 - 2019Q3	BC regions: R1, R2, R3, R4, R5, R6, R7 SK regions: R1, R2, R3, R4, R5
C.4: Using regional data	2007Q4 - 2015Q3	2015Q4 - 2019Q3	BC regions: R3, R4, R5, R6, R7 SK regions: R1, R2, R3, R4, R5
D: Backdating to 2013Q3	2007Q4 - 2013Q3	2013Q4 - 2019Q3	same as **A**
E: Backdating to 2011Q3	2007Q4 - 2011Q3	2011Q4 - 2019Q3	same as **A**

Notes: AB regions: Banff, Jasper, and Rocky Mountain House (R1), Calgary (R2), Camrose and Drumheller (R3), Edmonton (R4), Lethbridge (R5), Red Deer (R6), and Wood Buffalo and Cold Lake (R7). BC regions: Vancouver Island and Coast (R1), Lower Mainland-Southwest (R2), Thompson-Okanagan (R3), Kootenay (R4), Cariboo (R5), North Coast and Nechako (R6), and Northeast (R7). SK regions: Regina-Moose Mountain (R1), Swift Current-Moose Jaw (R2), Saskatoon-Biggar (R3), Yorkton-Melville (R4), and Prince Albert and Northern (R5).

A Additional Results

A.1 Variable Importance

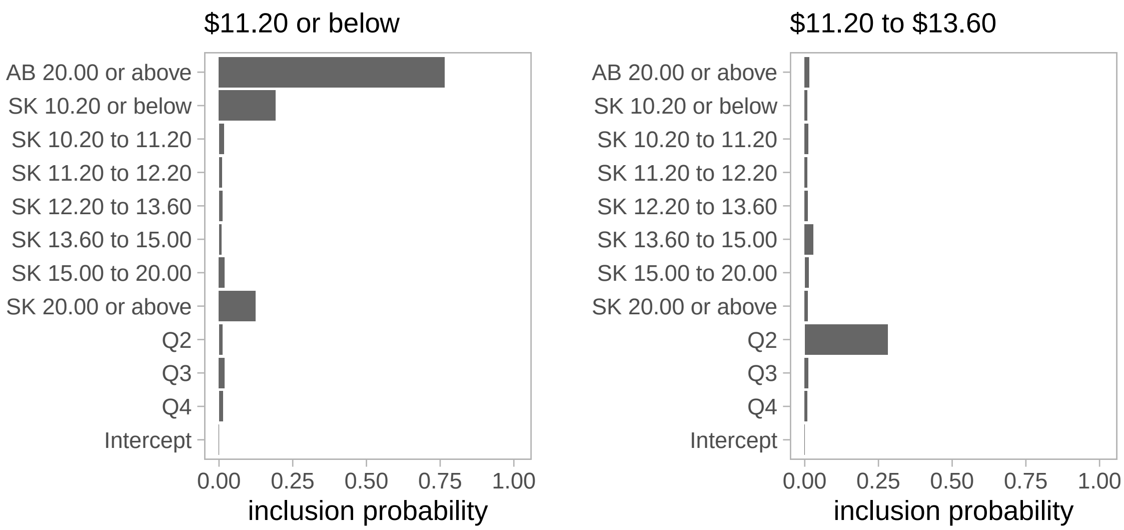

Figure A.1.1: Variable importance for employment effects by wage bins (main results). Variable importance is computed as the probability of inclusion in the averaged synthetic control counterfactual (the first 250 MCMC iterations are discarded as burn-in).

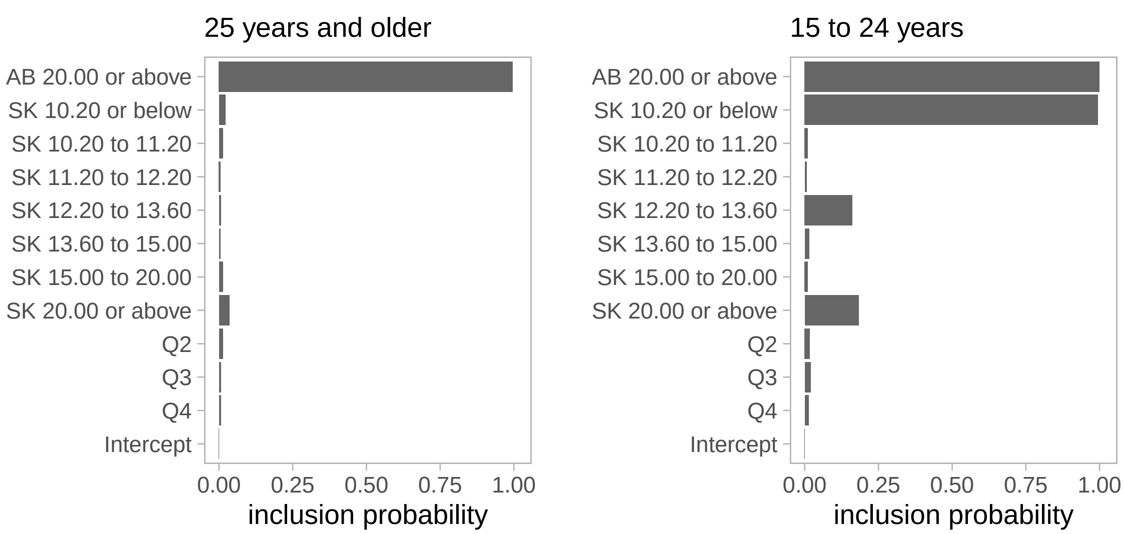

Figure A.1.2: Variable importance for employment effects by age groups (main results). Variable importance is computed as the probability of inclusion in the averaged synthetic control counterfactual (the first 250 MCMC iterations are discarded as burn-in).

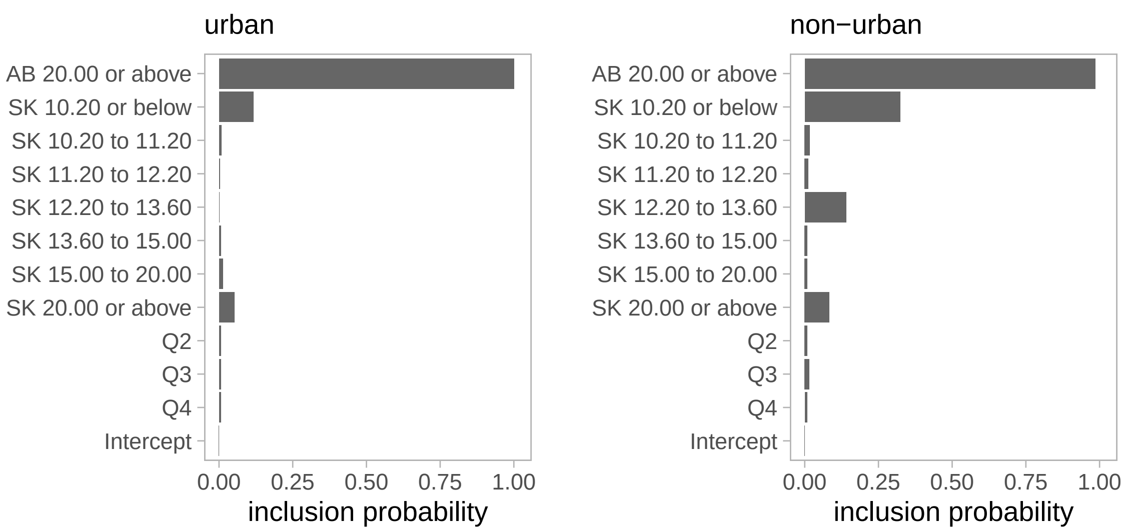

Figure A.1.3: Variable importance for employment effects by economic regions (main results). Variable importance is computed as the probability of inclusion in the averaged synthetic control counterfactual (the first 250 MCMC iterations are discarded as burn-in).

A.2 Additional Results by Wage

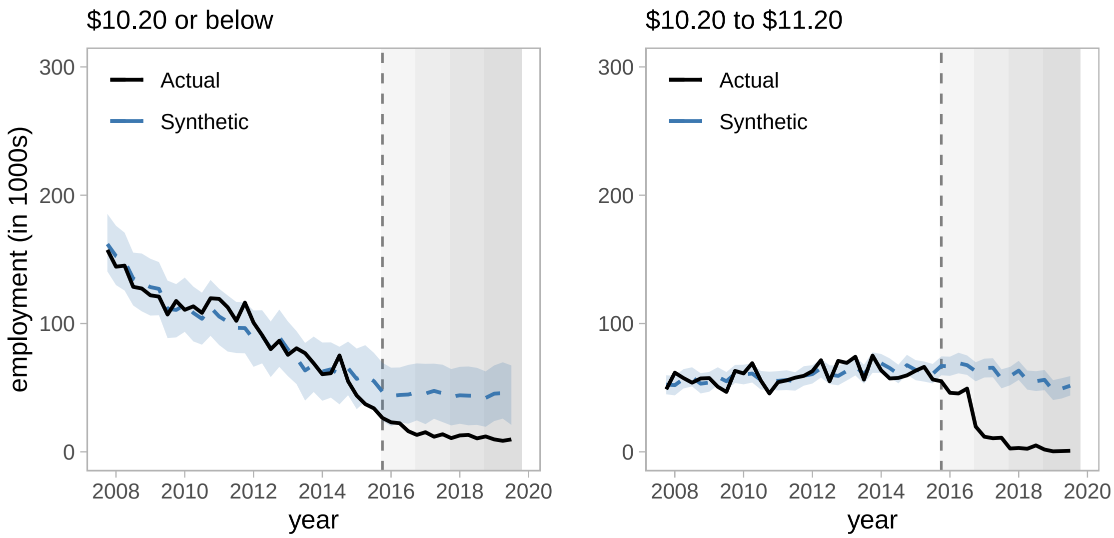

Figure A.2.1: Main results (by wage, bottom bins). Employment effects of Alberta's $15 minimum wage by wage bins. Authors' calculations of Labour Force Survey data from Statistics Canada. Solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. 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.

A.3 Additional Results by Age

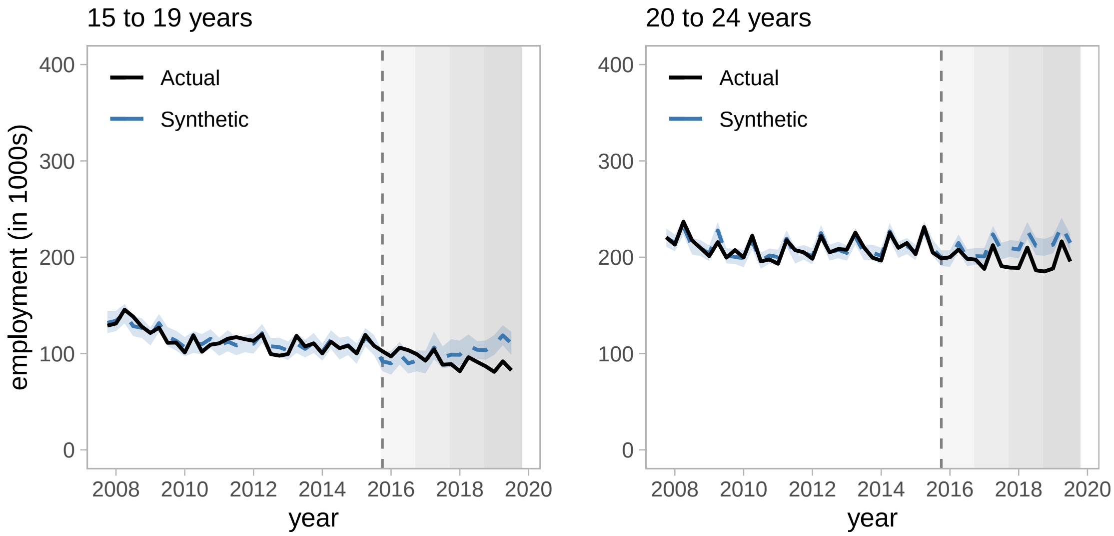

Figure A.3.1: Main results (by age, young workers). Employment effects of Alberta's \$15 minimum wage by age groups. Authors' calculations of Labour Force Survey data from Statistics Canada. Solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. 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.

A.4 Additional Results by Place

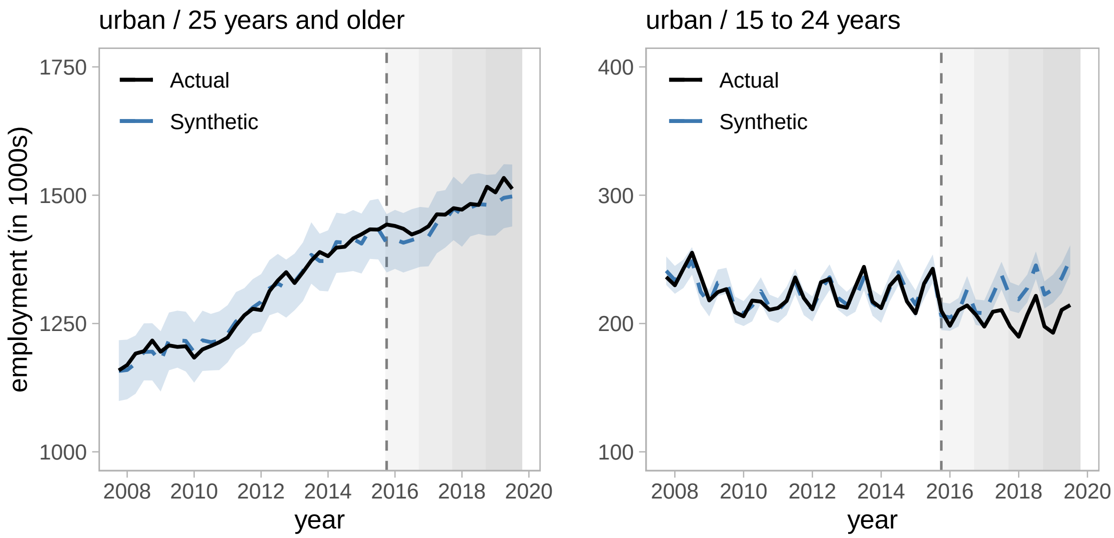

Figure A.4.1: Main results (urban workers, by age). Employment effects of Alberta's $15 minimum wage by economic regions. Authors' calculations of Labour Force Survey data from Statistics Canada. Solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. 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.

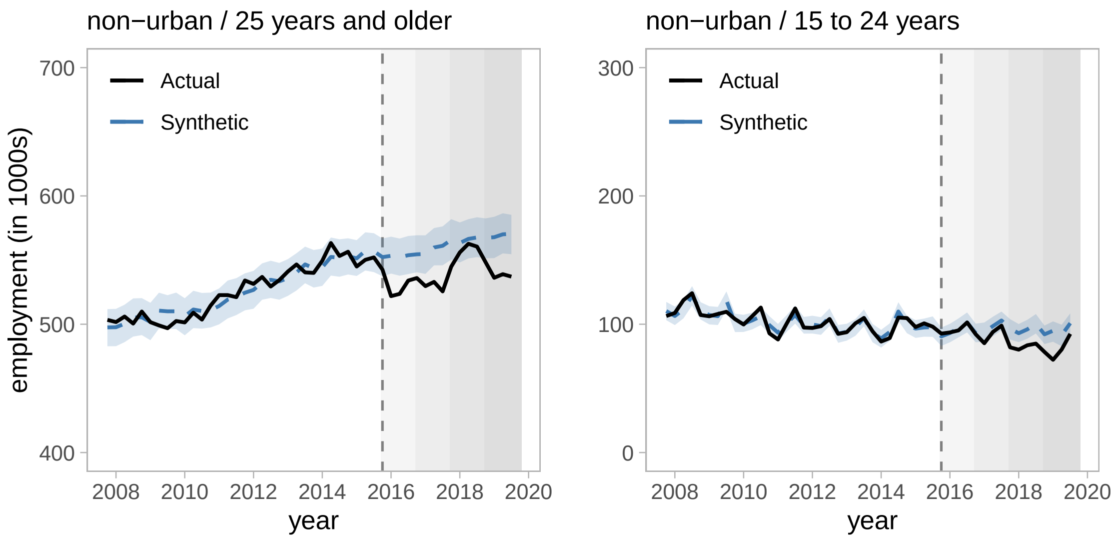

Figure A.4.2: Main results (non-urban workers, by age). Employment effects of Alberta's $15 minimum wage by economic regions. Authors' calculations of Labour Force Survey data from Statistics Canada. Solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. 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.

B Robustness: Changing the Pre-Intervention Sample

B.1 Changing the pre-intervention sample to 2011Q4-2015Q3

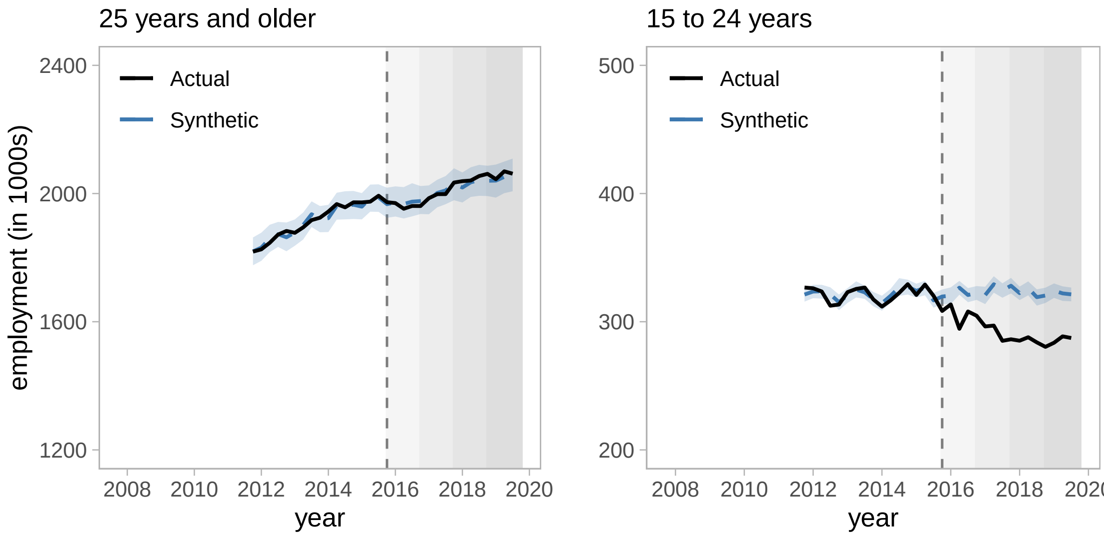

Figure B.1.1: Changing the pre-intervention sample to 2011Q4-2015Q3 (panel B, by age). Employment effects of Alberta's $15 minimum wage by age groups. Authors' calculations of Labour Force Survey data from Statistics Canada. Solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. 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.

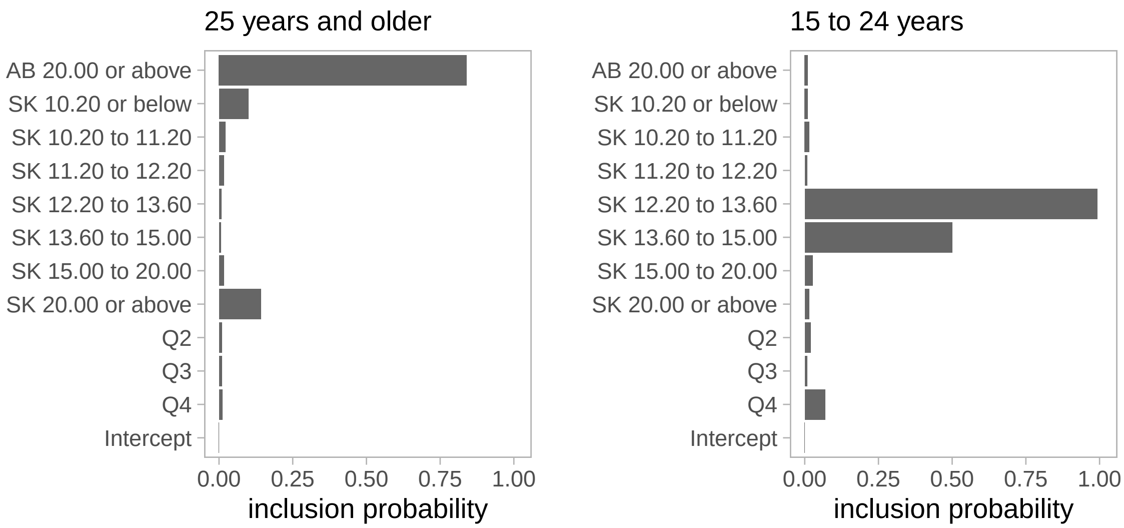

Figure B.1.2: Variable importance for employment effects by age groups (panel B, by age). Variable importance is computed as the probability of inclusion in the averaged synthetic control counterfactual (the first 250 MCMC iterations are discarded).

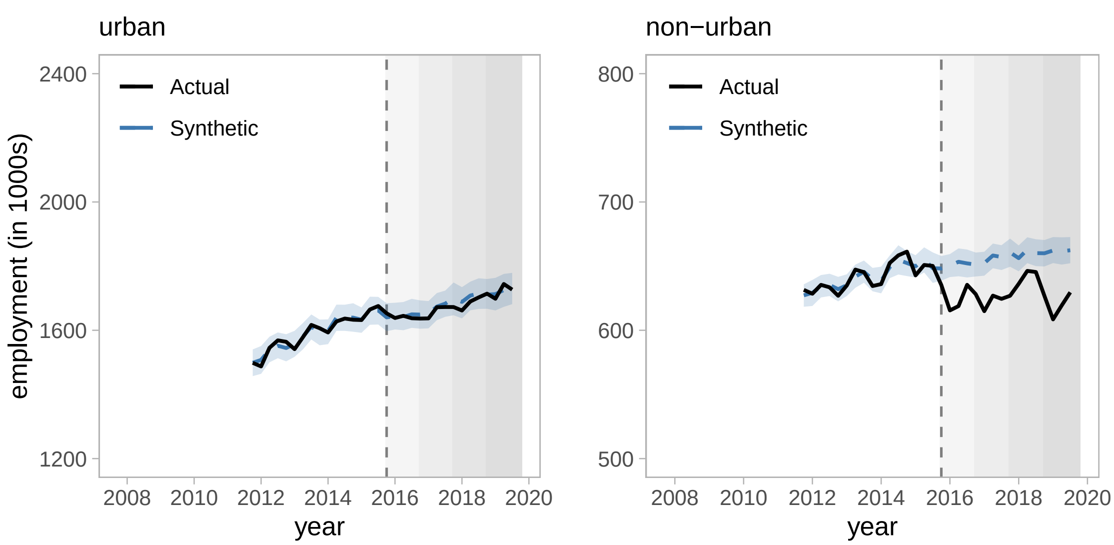

Figure B.1.3: Changing the pre-intervention sample to 2011Q4-2015Q3 (panel B, by place). Employment effects of Alberta's $15 minimum wage by economic regions. Authors' calculations of Labour Force Survey data from Statistics Canada. Solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. 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.

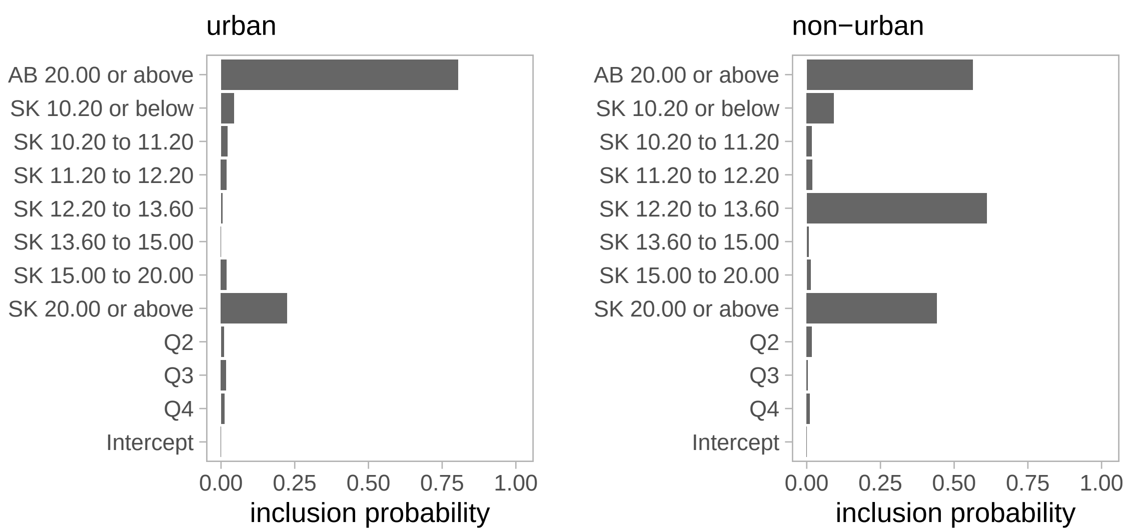

Figure B.1.4: Variable importance for employment effects by economic regions (panel B, by place). Variable importance is computed as the probability of inclusion in the averaged synthetic control counterfactual (the first 250 MCMC iterations are discarded).

B.2 Changing the pre-intervention sample to 2003Q4-2015Q3

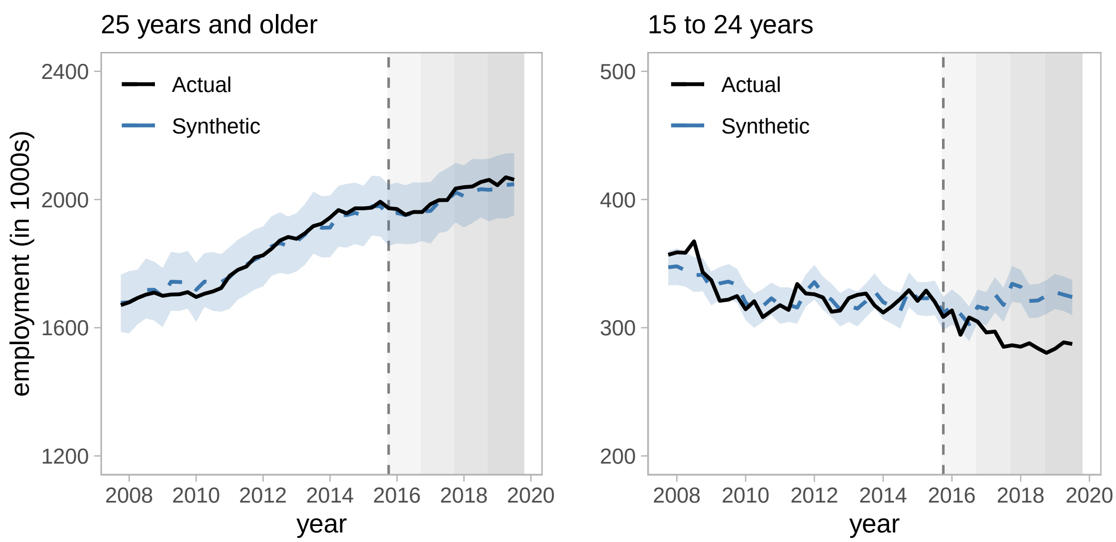

Figure B.2.1: Changing the pre-intervention sample to 2003Q4-2015Q3 (panel B, by age). Employment effects of Alberta's $15 minimum wage by age groups. Authors' calculations of Labour Force Survey data from Statistics Canada. Solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. 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.

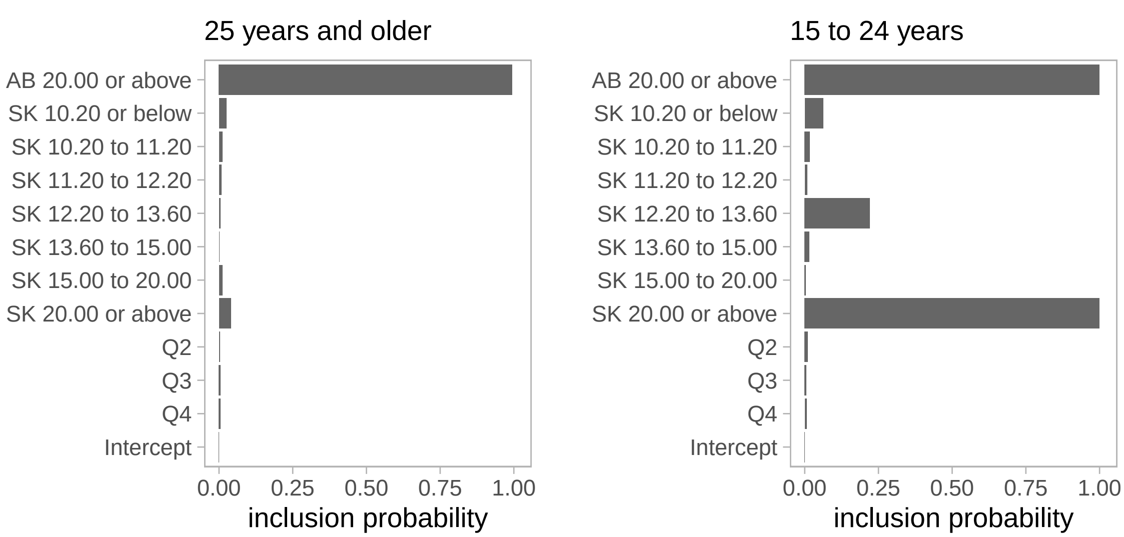

Figure B.2.2: Variable importance for employment effects by age groups (panel B, by age). Variable importance is computed as the probability of inclusion in the averaged synthetic control counterfactual (the first 250 MCMC iterations are discarded).

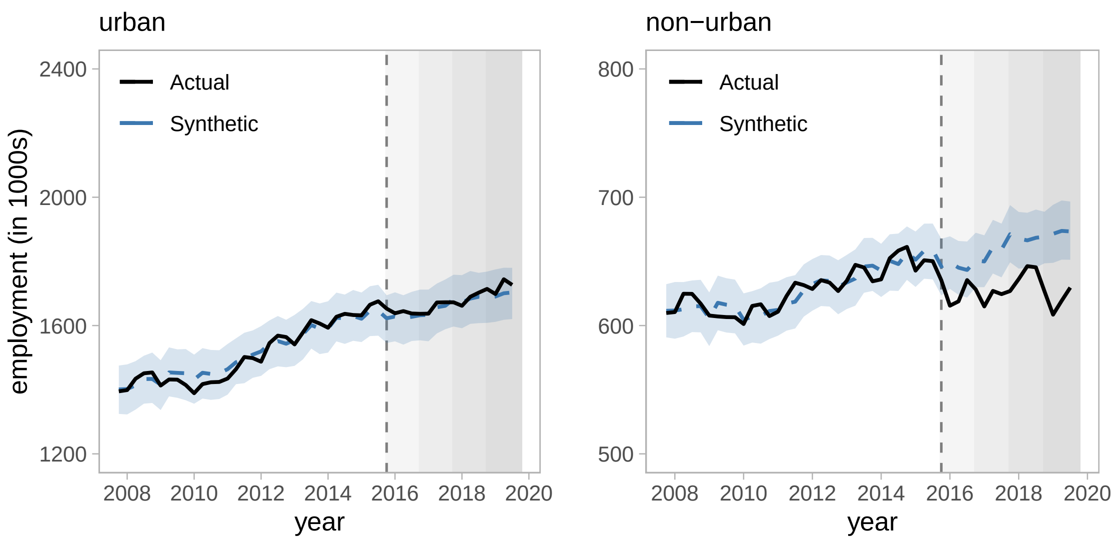

Figure B.2.3: Changing the pre-intervention sample to 2003Q4-2015Q3 (panel B, by place). Employment effects of Alberta's $15 minimum wage by economic regions. Authors' calculations of Labour Force Survey data from Statistics Canada. Solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. 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.

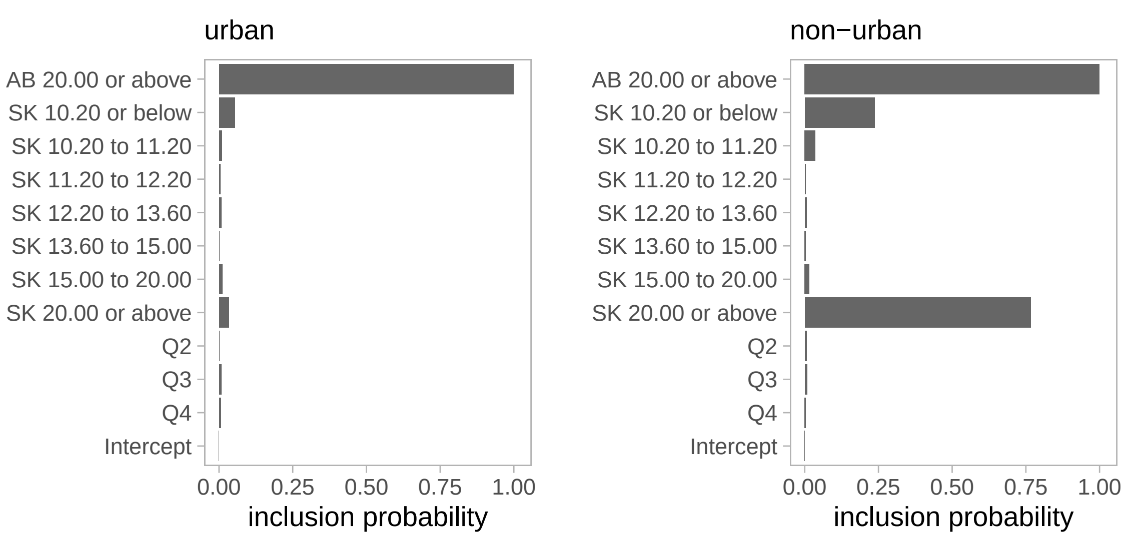

Figure B.2.4: Variable importance for employment effects by economic regions (panel B, by place). Variable importance is computed as the probability of inclusion in the averaged synthetic control counterfactual (the first 250 MCMC iterations are discarded).

C Robustness: Changing the Donor Pool

C.1 Only Saskatchewan wage bin data

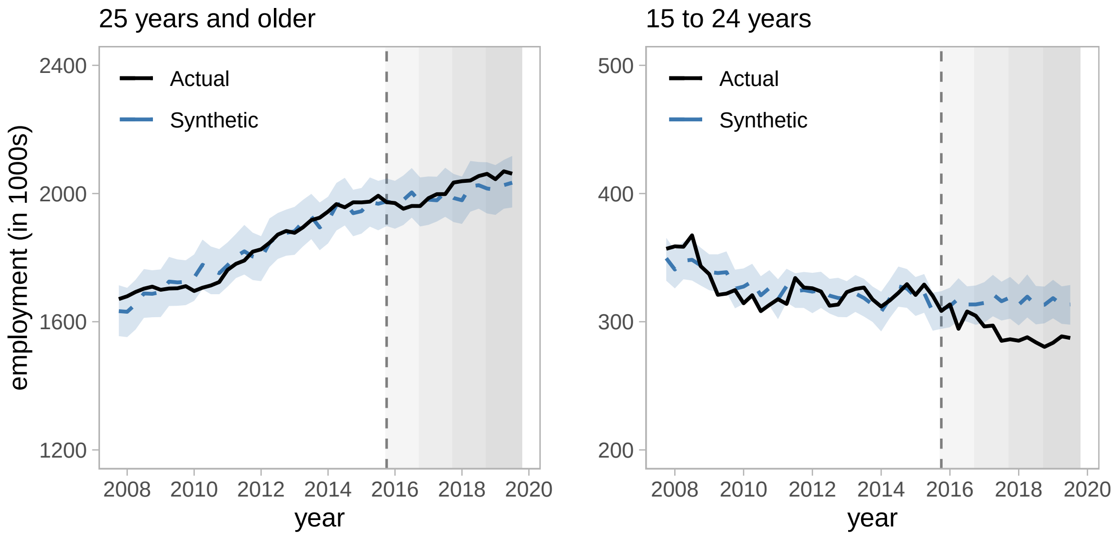

Figure C.1.1: Only Saskatchewan wage bin data (panel C, by age). Employment effects of Alberta's $15 minimum wage by age groups. Authors' calculations of Labour Force Survey data from Statistics Canada. Solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. 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.

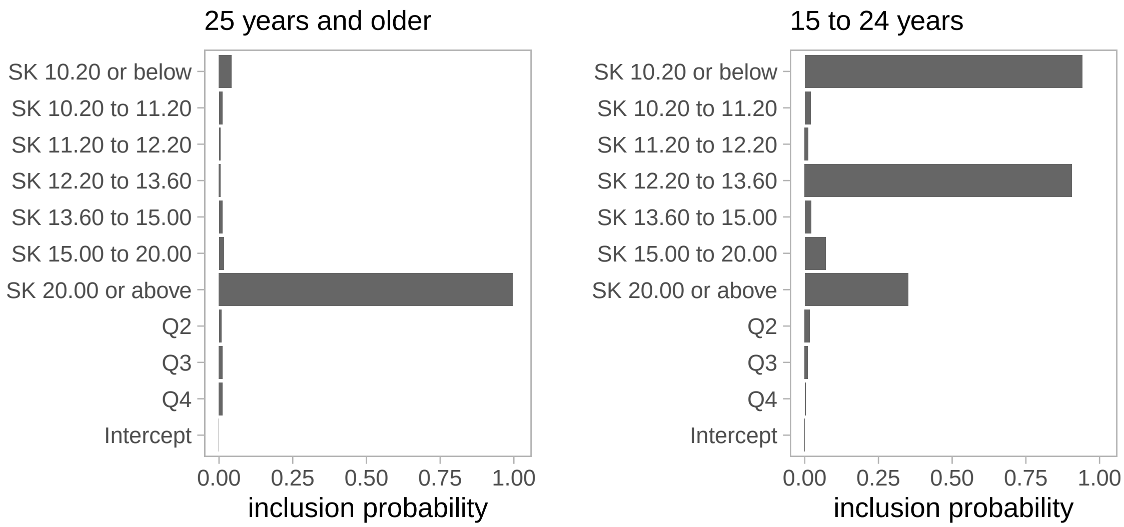

Figure C.1.2: Variable importance for employment effects by age groups (panel C, by age). Variable importance is computed as the probability of inclusion in the averaged synthetic control counterfactual (the first 250 MCMC iterations are discarded).

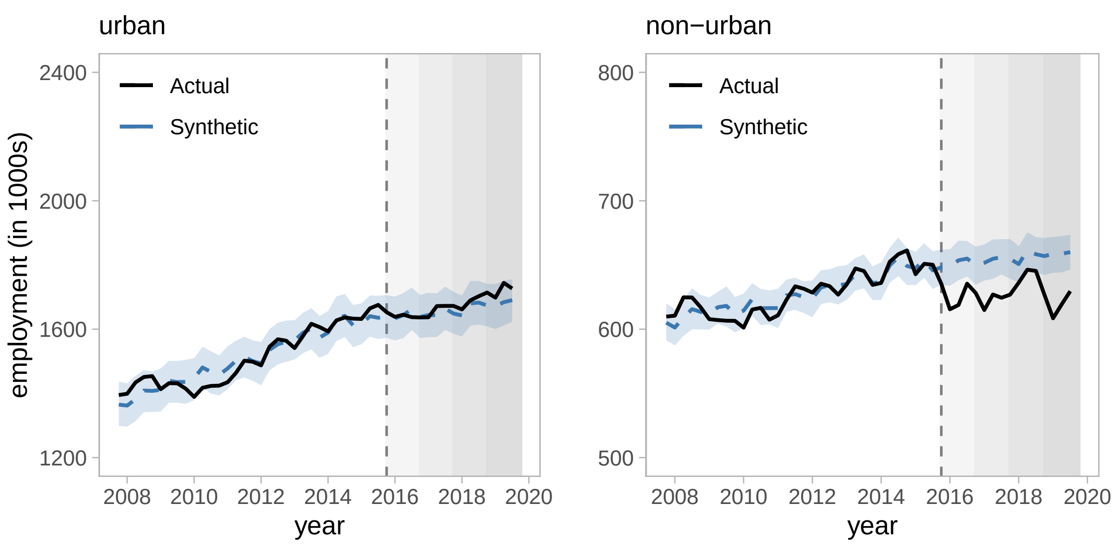

Figure C.1.3: Only Saskatchewan wage bin data (panel C, by place). Employment effects of Alberta's $15 minimum wage by economic regions. Authors' calculations of Labour Force Survey data from Statistics Canada. Solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. 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.

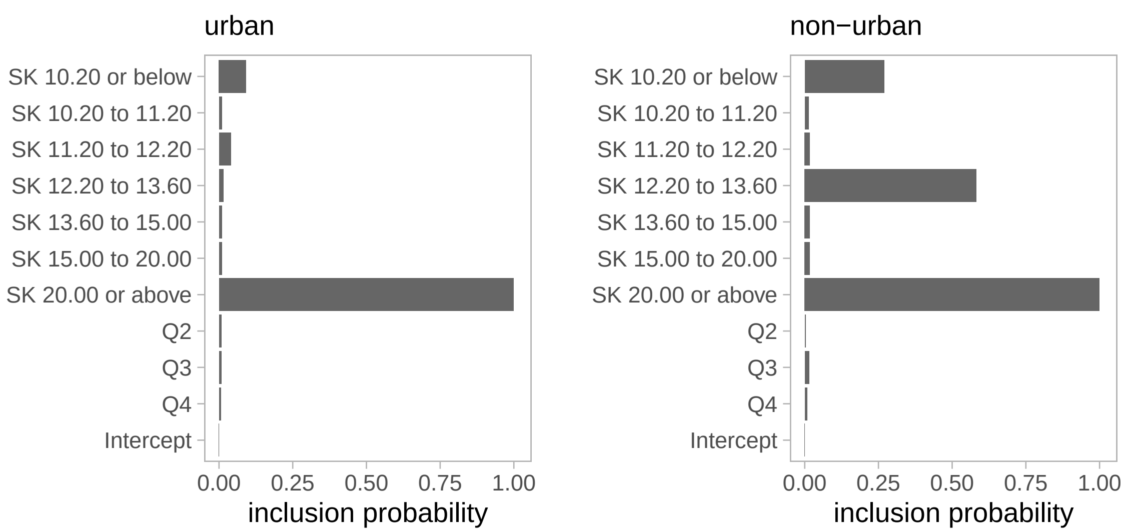

Figure C.1.4: Variable importance for employment effects by economic regions (panel C, by place). Variable importance is computed as the probability of inclusion in the averaged synthetic control counterfactual (the first 250 MCMC iterations are discarded).

C.2 Adding British Columbia wage bin data

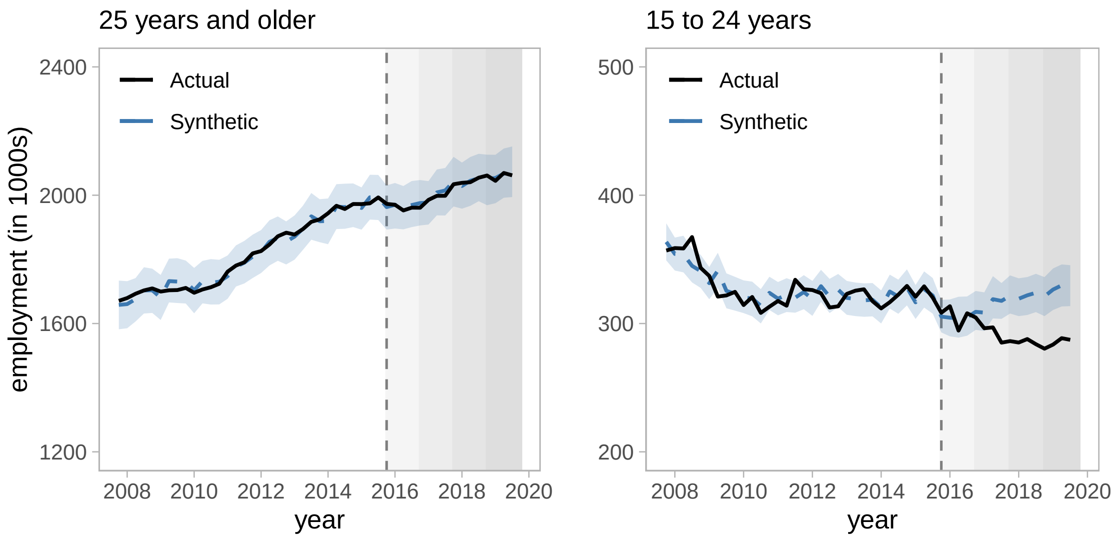

Figure C.2.1: Adding British Columbia wage bin data (panel C, by age). Employment effects of Alberta's $15 minimum wage by age groups. Authors' calculations of Labour Force Survey data from Statistics Canada. Solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. 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.

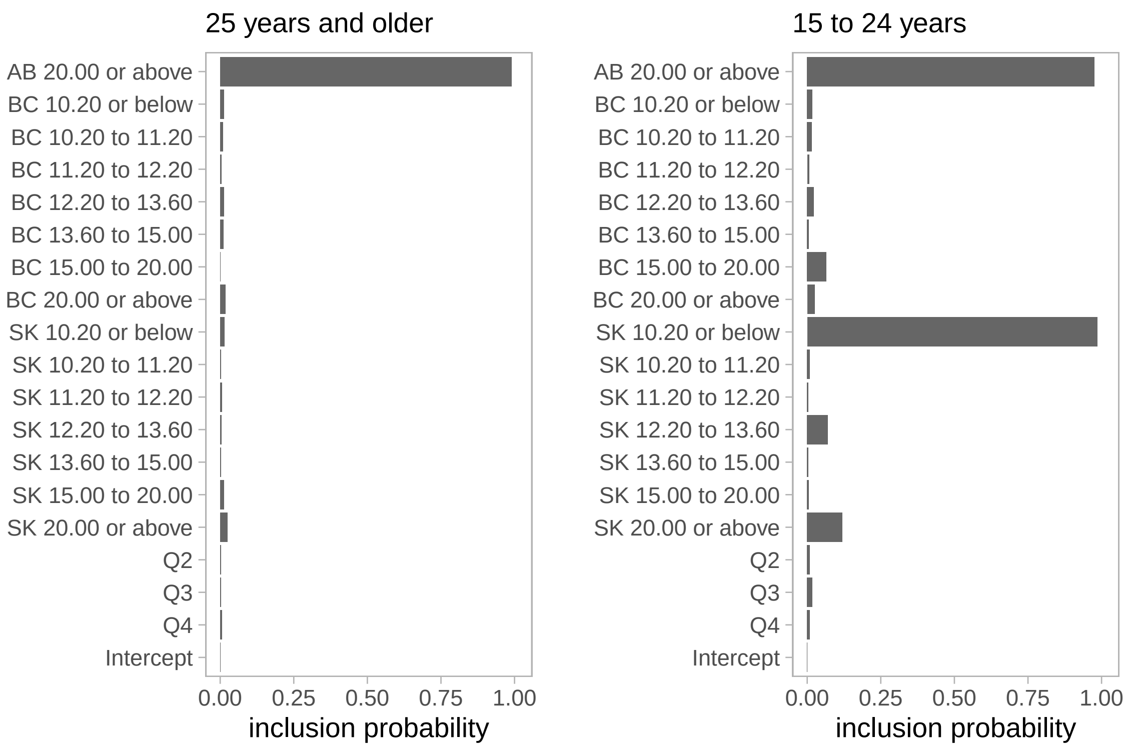

Figure C.2.2: Variable importance for employment effects by age groups (panel C, by age). Variable importance is computed as the probability of inclusion in the averaged synthetic control counterfactual (the first 250 MCMC iterations are discarded).

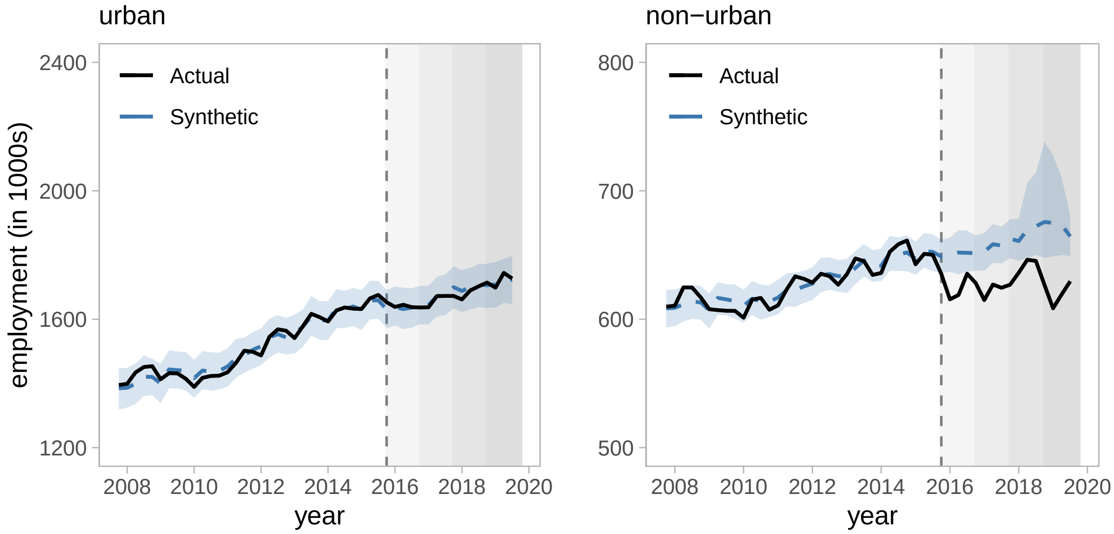

Figure C.2.3: Adding British Columbia wage bin data (panel C, by place). Employment effects of Alberta's $15 minimum wage by economic regions. Authors' calculations of Labour Force Survey data from Statistics Canada. Solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. 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.

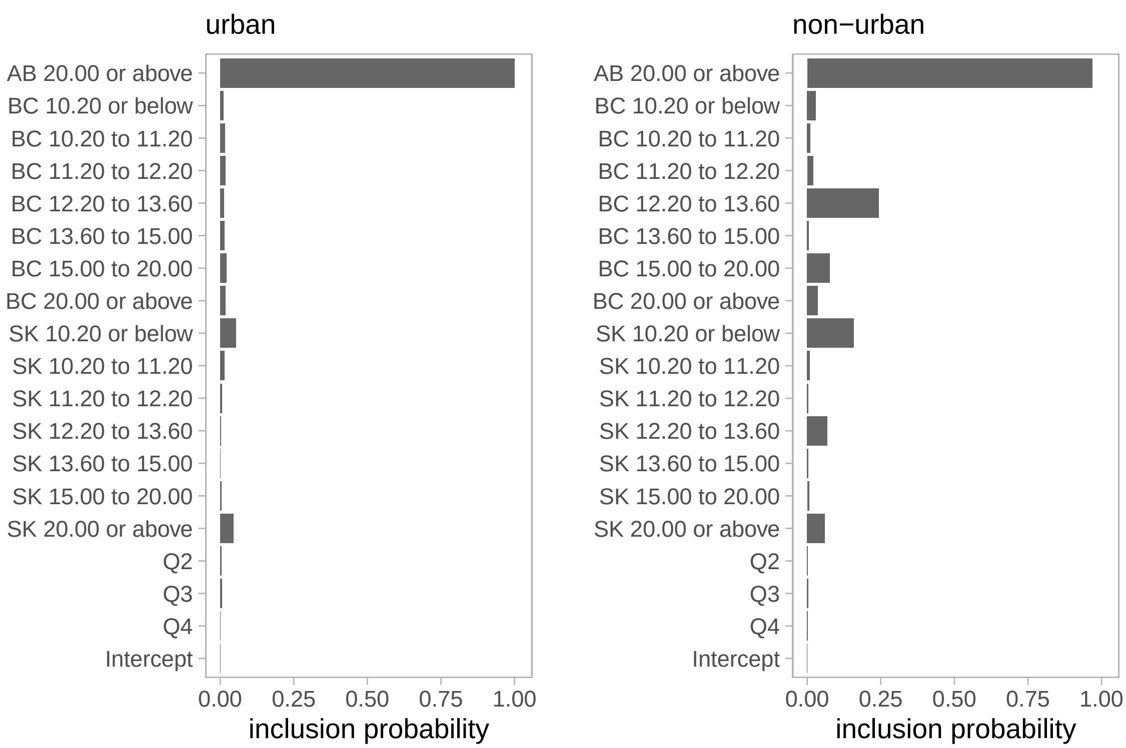

Figure C.2.4: Variable importance for employment effects by economic regions (panel C, by place). Variable importance is computed as the probability of inclusion in the averaged synthetic control counterfactual (the first 250 MCMC iterations are discarded).

C.3 Using regional data

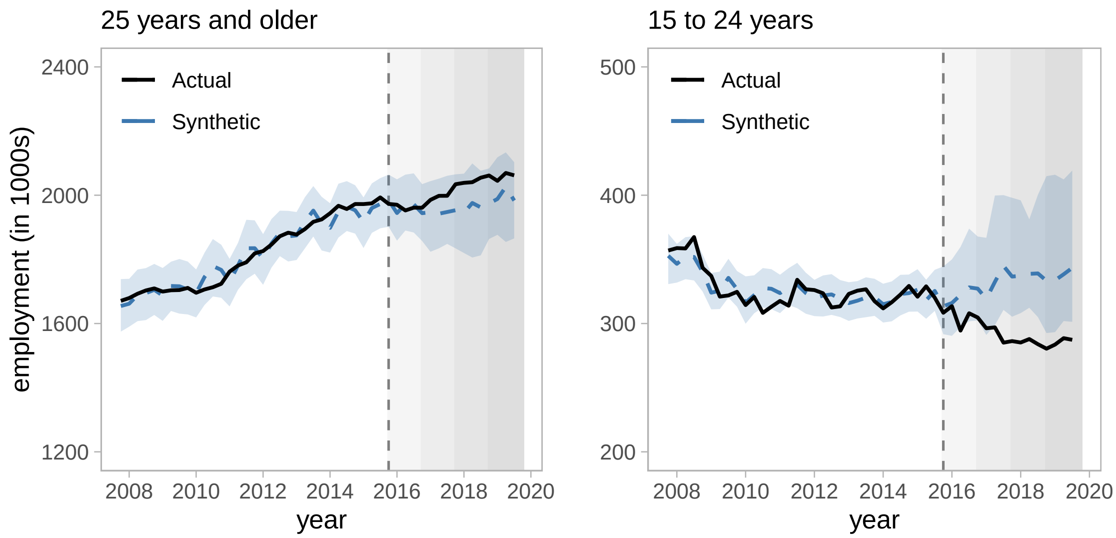

Figure C.3.1: Using regional data (panel C, by age). Employment effects of Alberta's $15 minimum wage by age groups. Authors' calculations of Labour Force Survey data from Statistics Canada. Solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. 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.

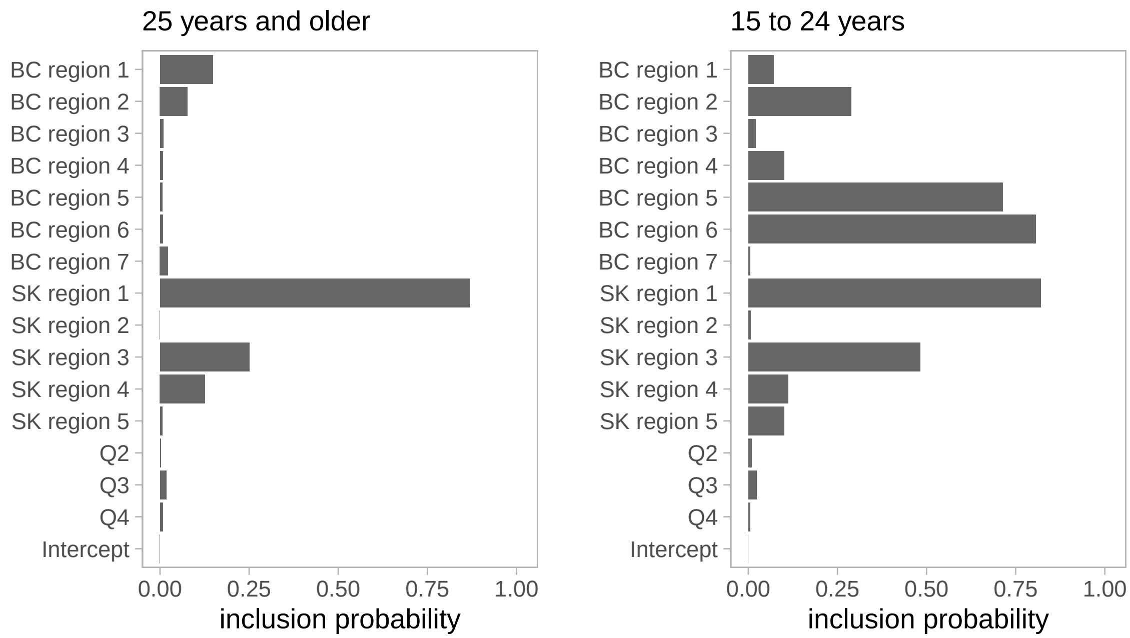

Figure C.3.2: Variable importance for employment effects by age groups (panel C, by age). Variable importance is computed as the probability of inclusion in the averaged synthetic control counterfactual (the first 250 MCMC iterations are discarded).

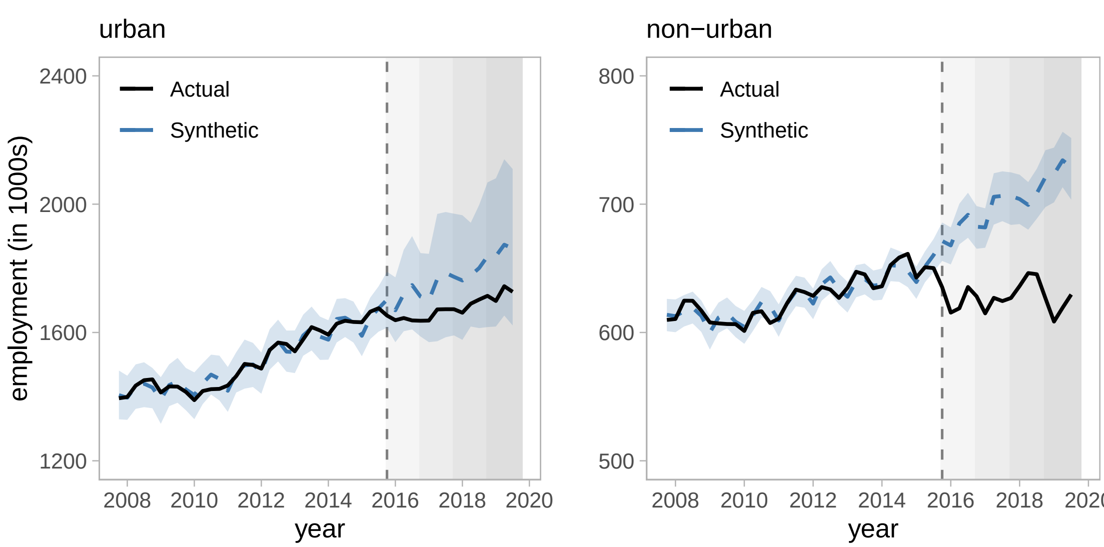

Figure C.3.3: Using regional data (panel C, by place). Employment effects of Alberta's $15 minimum wage by economic regions. Authors' calculations of Labour Force Survey data from Statistics Canada. Solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. 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.

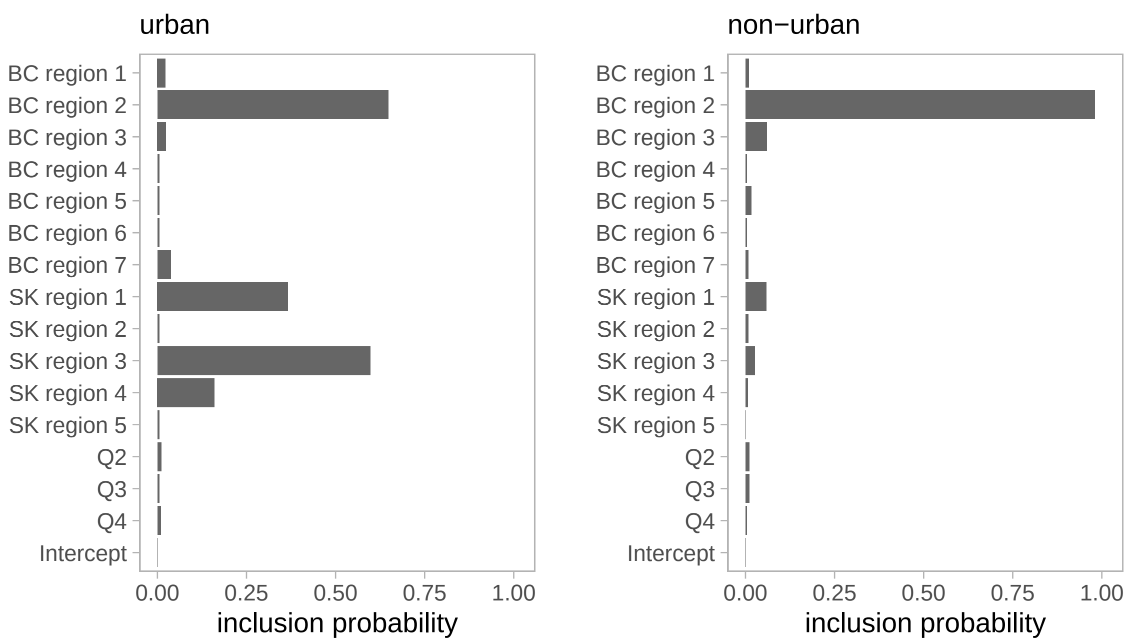

Figure C.3.4: Variable importance for employment effects by economic regions (panel C, by place). Variable importance is computed as the probability of inclusion in the averaged synthetic control counterfactual (the first 250 MCMC iterations are discarded).

C.4 Using regional data but excluding Vancouver

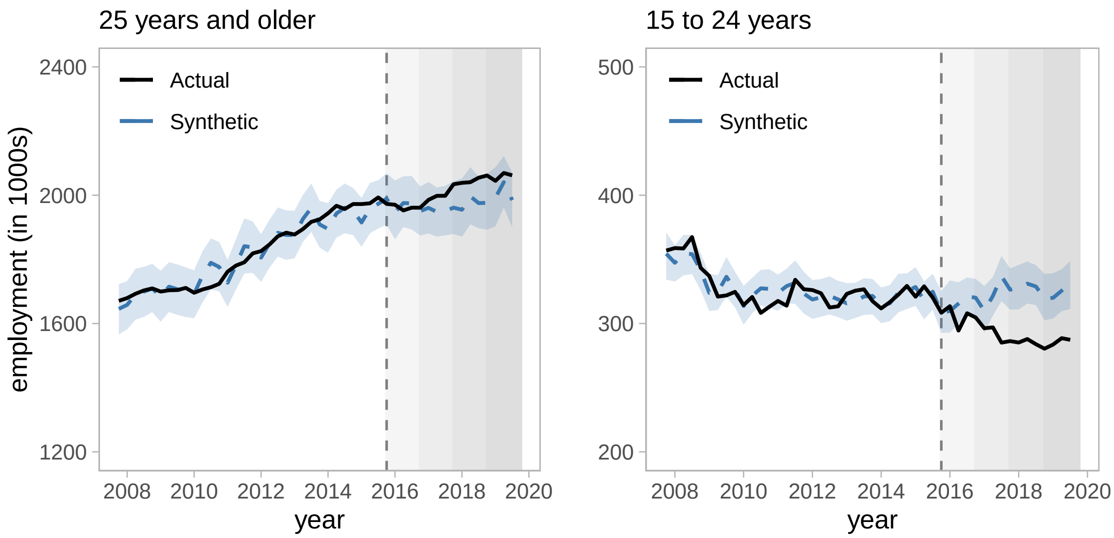

Figure C.4.1: Using regional data but excluding Vancouver (panel C, by age). Employment effects of Alberta's $15 minimum wage by age groups. Authors' calculations of Labour Force Survey data from Statistics Canada. Solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. 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.

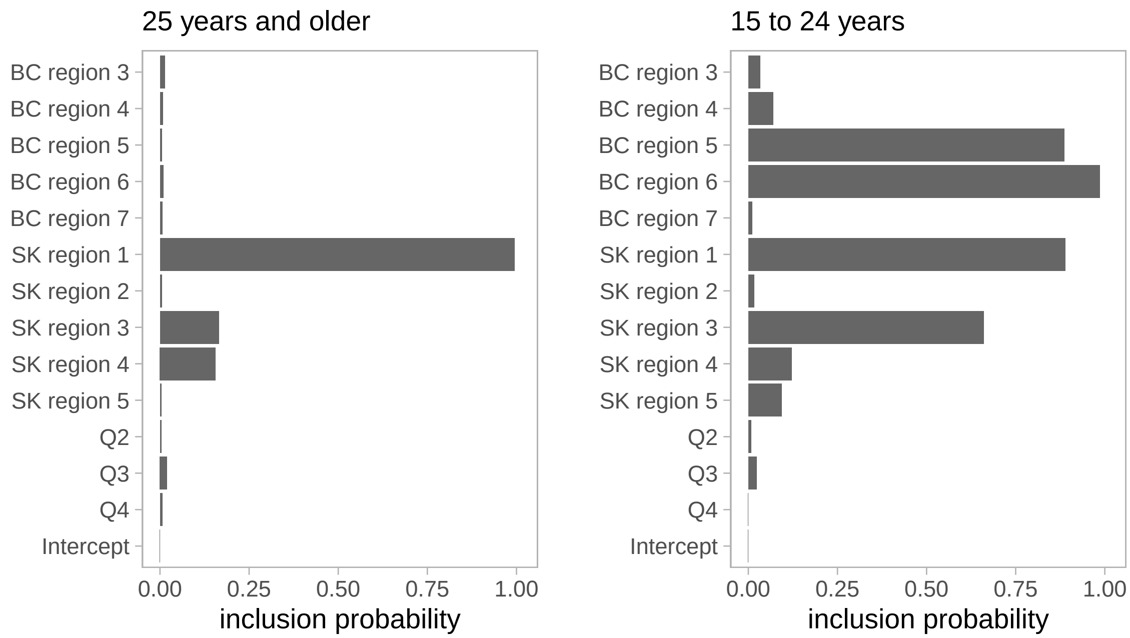

Figure C.4.2: Variable importance for employment effects by age groups (panel C, by age). Variable importance is computed as the probability of inclusion in the averaged synthetic control counterfactual (the first 250 MCMC iterations are discarded).

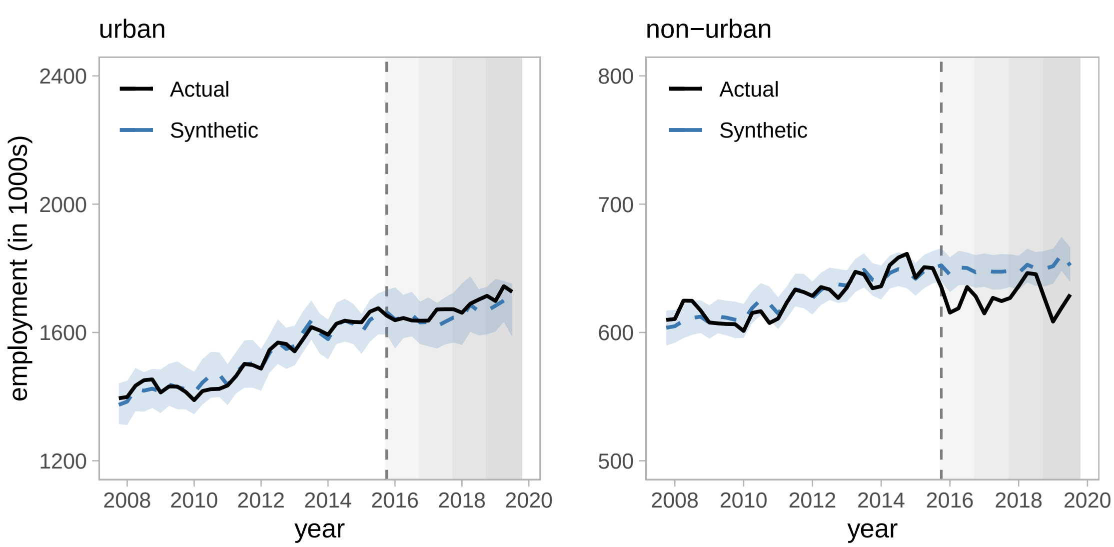

Figure C.4.3: Using regional data but excluding Vancouver (panel C, by place). Employment effects of Alberta's $15 minimum wage by economic regions. Authors' calculations of Labour Force Survey data from Statistics Canada. Solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. 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.

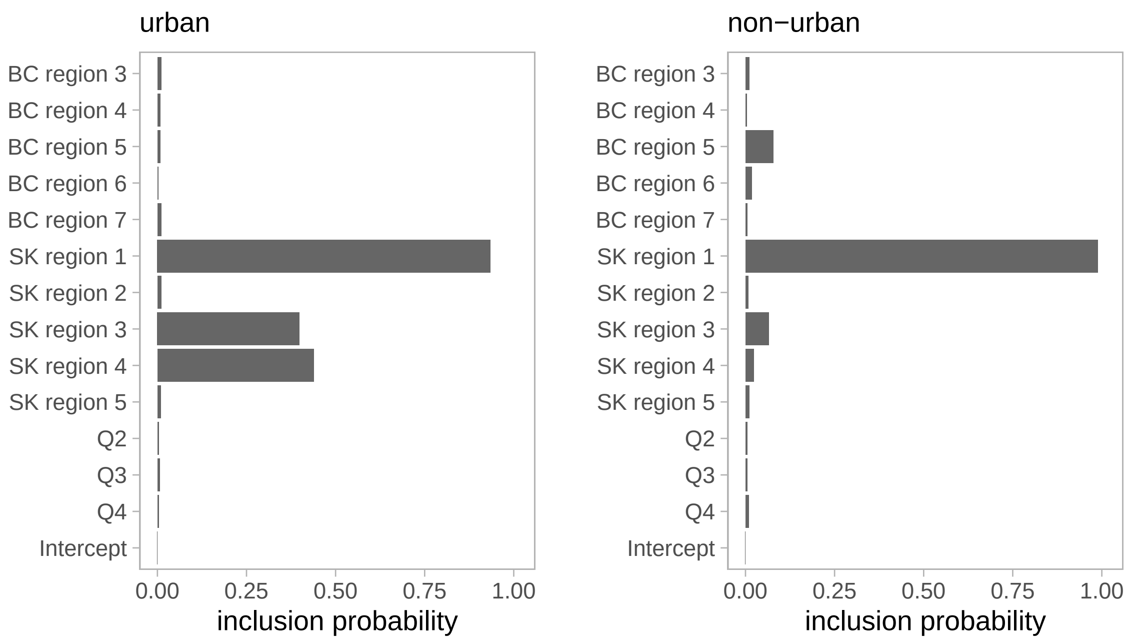

Figure C.4.4: Variable importance for employment effects by economic regions (panel C, by place). Variable importance is computed as the probability of inclusion in the averaged synthetic control counterfactual (the first 250 MCMC iterations are discarded).

D Robustness: Backdating to 2013Q3

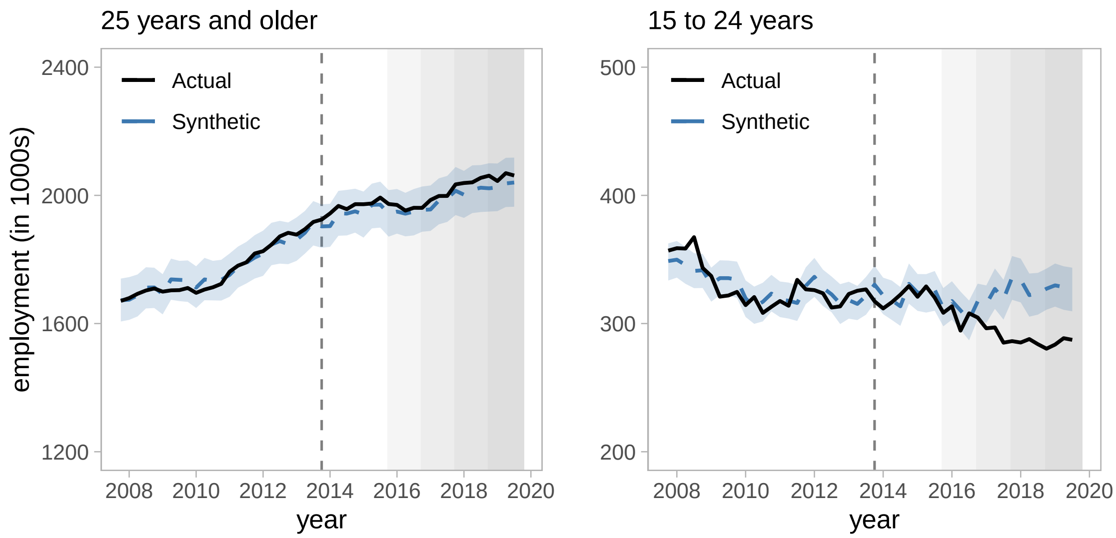

Figure D.1.1: Backdating to 2013Q3 (panel D, by age). Employment effects of Alberta's $15 minimum wage by age groups. Authors' calculations of Labour Force Survey data from Statistics Canada. Solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. 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.

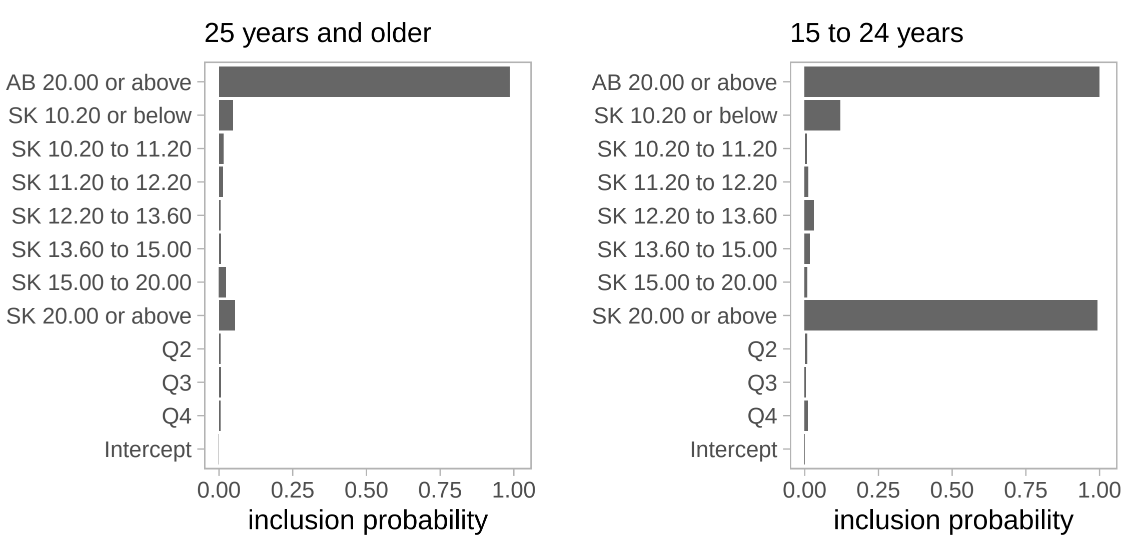

Figure D.1.2: Variable importance for employment effects by age groups (panel D, by age). Variable importance is computed as the probability of inclusion in the averaged synthetic control counterfactual (the first 250 MCMC iterations are discarded).

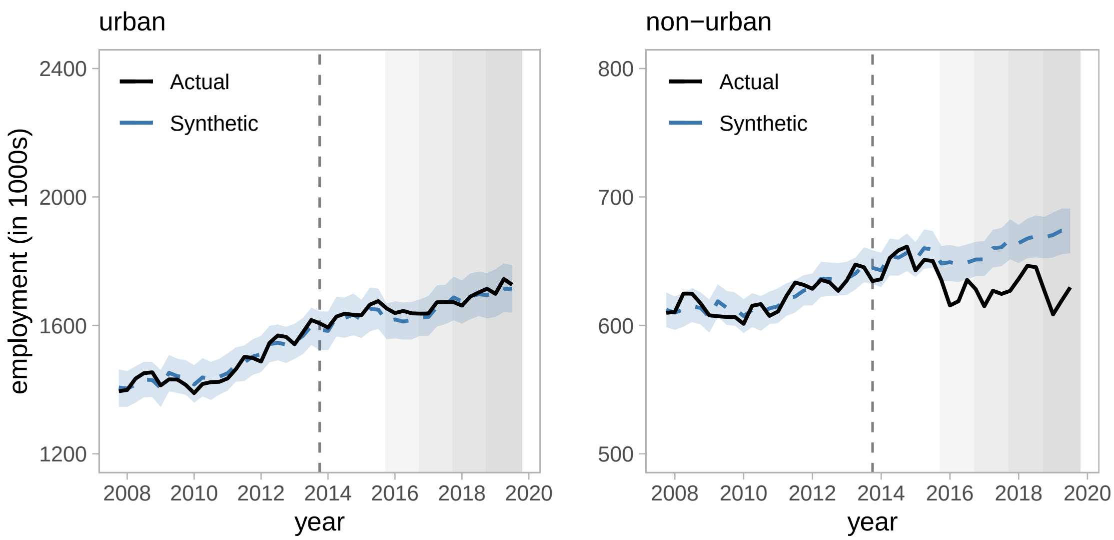

Figure D.1.3: Backdating to 2013Q3 (panel D, by place). Employment effects of Alberta's $15 minimum wage by economic regions. Authors' calculations of Labour Force Survey data from Statistics Canada. Solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. 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.

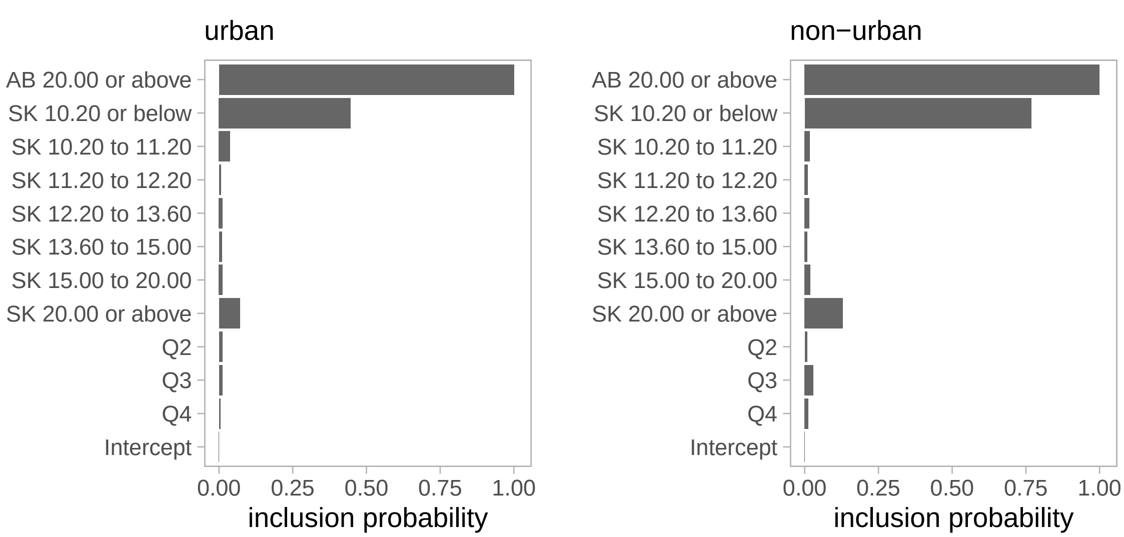

Figure D.1.4: Variable importance for employment effects by economic regions (panel D, by place). Variable importance is computed as the probability of inclusion in the averaged synthetic control counterfactual (the first 250 MCMC iterations are discarded).

E Robustness: Backdating to 2011Q3

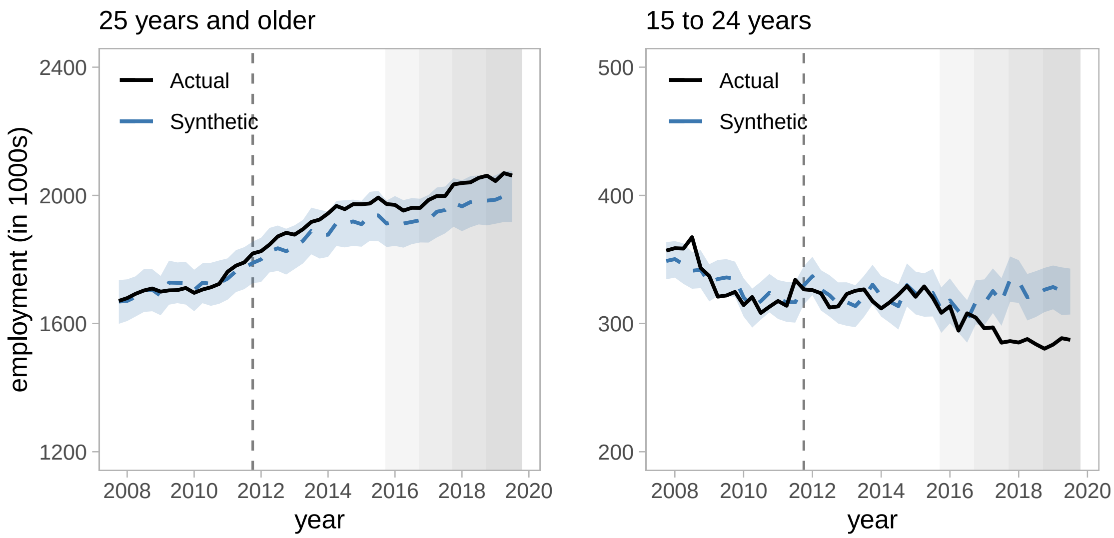

Figure E.1.1: Backdating to 2011Q3 (panel E, by age). Employment effects of Alberta's \$15 minimum wage by age groups. Authors' calculations of Labour Force Survey data from Statistics Canada. Solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. 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.

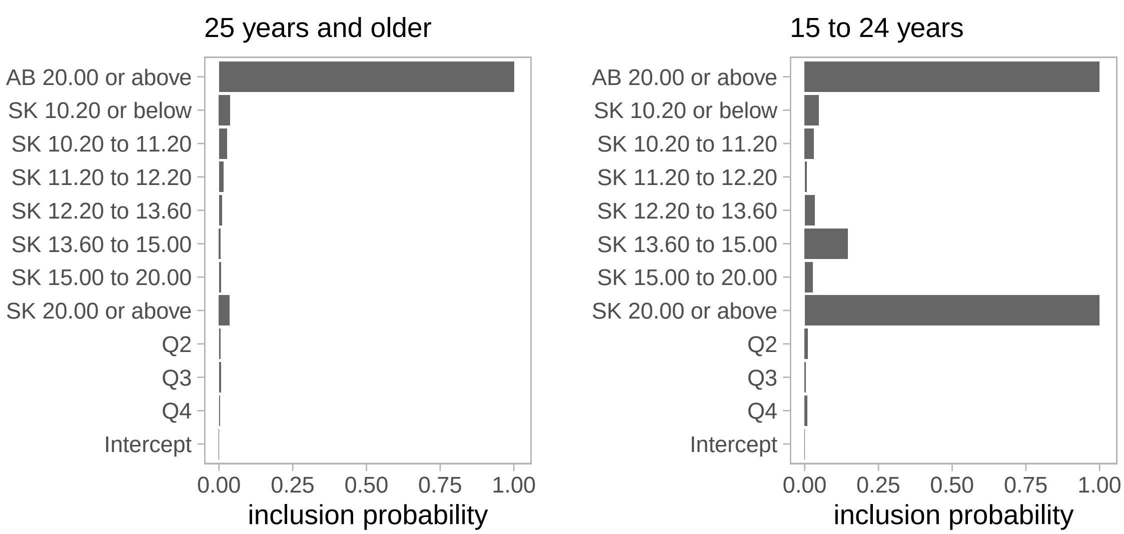

Figure E.1.2: Variable importance for employment effects by age groups (panel E, by age). Variable importance is computed as the probability of inclusion in the averaged synthetic control counterfactual (the first 250 MCMC iterations are discarded).

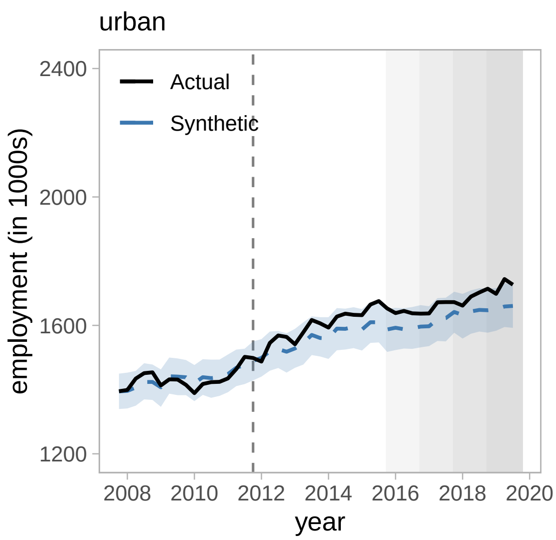

Figure E.1.3: Backdating to 2011Q3 (panel E, by place). Employment effects of Alberta's $15 minimum wage by economic regions. Authors' calculations of Labour Force Survey data from Statistics Canada. Solid black lines show actual employment levels in Alberta (quarterly, seasonally-adjusted) with minimum wage changes. 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.

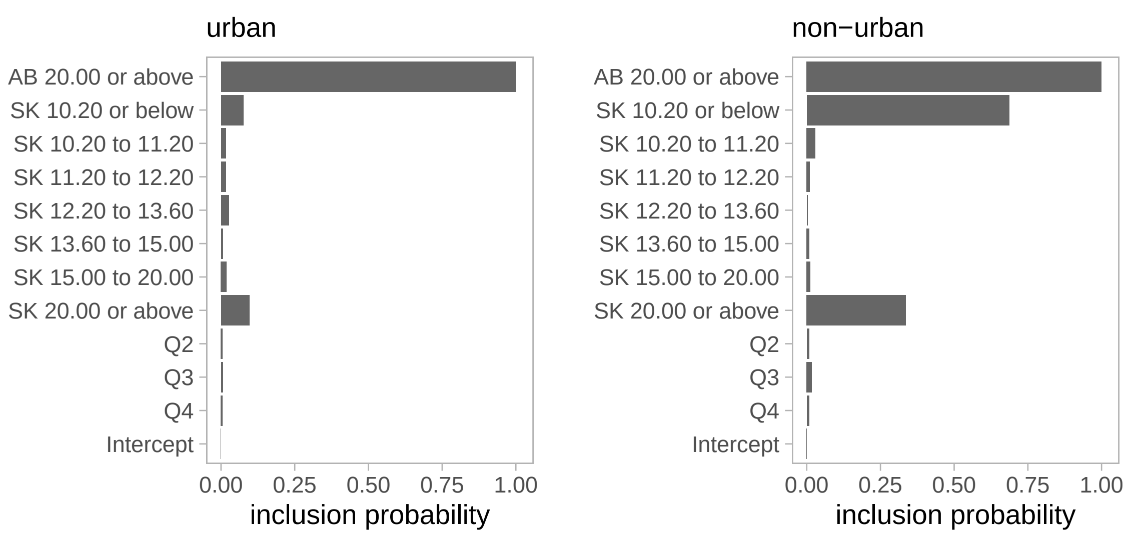

Figure E.1.4: Variable importance for employment effects by economic regions (panel E, by place). Variable importance is computed as the probability of inclusion in the averaged synthetic control counterfactual (the first 250 MCMC iterations are discarded).