The Kansas Tax Experiment: Impact of 2012 Kansas Tax Reform on Output, Employment & Establishments

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Abstract: This paper uses the synthetic control method (SCM) to empirically examine impacts of Kansas tax reform aimed at job creation and promoting economic growth. Results suggest that the tax reform did not have the impact desired on employment, real gross state product (RGSP) per capita, or on the overall number of business establishments in Kansas. Results for private sector RGSP are similar to those for the combined private and public sector. Different overall measures of employment show no impact, however when decomposed there is evidence of a positive impact on proprietor employment offset by declining wage and salary employment.

1. Introduction

In 2012, Kansas enacted major tax reform, with primary goals of promoting economic growth and job creation. The Governor described the reform as a "real live experiment" and predicted it would be "like a shot of adrenaline into the heart of the Kansas economy" (MSNBC 2012). Job creation was a major theme in promoting the new tax package, with emphasis placed on small and new businesses. At the signing ceremony, the Governor announced: "Today's legislation will create tens of thousands of new jobs and help make Kansas the best place in America to start and grow a small business." A state representative proclaimed: "Kansas is embarking on and setting the threshold for the nation with a pro-growth, pro-jobs tax reform policy. Lowering taxes on individuals and small businesses will jump start the private sector growth in Kansas, allowing Kansans to grow Kansas." A media release provided that: "Dynamic projections show the new law will result in 22,900 new jobs, give $2 billion more in disposable income to Kansans and increase population by 35,740, all in addition to the normal growth of the state" (Kansas Office of the Governor 2012).[2]

Major facets of the reform were decreasing the individual income tax rates (from 3.5 to 3 percent, and from 6.25 and 6.45 to 4.9 percent), and a 'business income exclusion,' which essentially excluded self-employment, pass-through business, rental real estate, royalty, and

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[2] The time frame for those projections was not provided in the release, but appears to have been by 2020.

farming incomes from the state income tax.[3] These changes took effect at the start of 2013. Corporate income taxes did not change, although corporate rates were cut in prior years.

The legislation included limited revenue increasing measures. Additional base-broadening measures originally proposed were cut from the legislation prior to enactment. Surplus funds were initially available and new revenue was expected from casinos. But there was no clear plan to offset the decline in revenue expected to accompany the tax cuts. This has been a major criticism of the policy. Because Kansas has a constitutional mandate requiring a balanced budget, it also ensured that future changes (on the spending side, the revenue side, or on both sides) would be necessary.[4]

Initial estimates from the Kansas Legislative Research Department of the reforms expected impact on State General Fund receipts were that it would result in a net lost tax revenue of $231.2 million for fiscal year 2013 (only partially overlapping policy effective dates), $802.8 million for fiscal year 2014, and greater in each of the next four fiscal years. The six-year total estimated net lost revenue was $4,539.1 million (Kansas Legislative Research Department 2012). Figure 1 plots annual state-level individual income tax collections in Kansas from 1994 to 2015. For comparison, averages from two groups of regional states, and from all U.S. states are also plotted.[5] Following the reform, individual income tax collections in Kansas sharply decline, while comparison group means continue to rise. Total tax revenue also initially declines, although not as sharply. From 2012 to 2013, individual income tax revenue declined 19.4 percent while total tax revenue declined 4.5 percent.

Previous work examining impacts of the same tax legislation focuses on the the business income exclusion (DeBacker et al. 2016; Turner and Blagg 2017). This paper adds to their findings by examining additional outcomes and by considering the effects of the entire policy, which, in addition to the business income exclusion, included a substantial drop in the top marginal individual income rate. It uses the synthetic control method (SCM) to analyze

[3] More precisely, it fully excluded from the state income tax all income reported on lines 12, 17, and 18 of a taxpayers' federal return form (1040).

[4] Theoretically, a tax cut could "pay for itself" if it results in increased economic activity and taxes imposed on that increased activity exceed declines from the cut. However, based on the legislative record and official statements relating to the policy changes, it does not appear that this type of effect was envisioned. The initial inclusion of base broadening provisions further signals an understanding that the enacted provisions were not going to finance themselves. And the projected economic benefits (in terms of job and population growth), even under favorable estimates, would not bring revenue gains in excess of the losses.

[5] The regional groups are: (1) the four states that border Kansas: Colorado, Missouri, Nebraska, and Oklahoma, and (2) a slightly modified version of those states, replacing Colorado with Iowa, which is believed to be more similar to Kansas.

the impact on real gross state product (RGSP) per capita, employment, and the number of business establishments. Results suggest that the tax cuts did not have the desired impact on most of the outcomes examined.

Section 2 of this paper briefly discusses select related literature. Section 3 provides additional background surrounding the policy changes of interest. Section 4 describes the empirical framework used in evaluating the policy changes. Section 5 describes the data and samples. The remaining sections present empirical results and conclusions.

2. Literature Review

As mentioned, the two major components of the 2012 Kansas tax reform were: (1) the decrease in individual income rates, and (2) the business income exclusion. Both are components of the individual income tax system, but theoretically apply to different types of activity. This section discusses select literature on impacts of individual and business income taxes on economic outcomes, focusing primarily on state-level taxes. It then discusses two other papers that look at impacts of the 2012 Kansas tax reform.

Empirical evidence on the efficacy of tax cuts as a policy tool for job creation is mixed. Theoretically, the impact is ambiguous. In the context of state corporate income taxes, Ljungvist and Smolyansky (2014) find evidence of asymmetric results. In particular, they find that a one percentage point increase in the top marginal state corporate income tax rate reduced employment by 0.3 to 0.5 percent (and income by between 0.3 and 0.6 percent), measured relative to neighboring counties on the other side of the state border. Rate decreases, on the other hand, only significantly impacted employment and income during recessions.

Shuai and Chmura (2013) find evidence that state corporate income tax rate changes produce short run, transitory impacts. They find significant impacts on state employment growth, observed primarily in the first year. Results indicate that the act of cutting alone (measured by a binary indicator) has a significant positive impact in the year of the cut, an insignificant positive effect the year after, and basically no impact in subsequent years.

At the federal level, Mertens and Ravn (2013) find evidence that corporate income tax rates impact GDP and investment but not employment or consumption. Specifically, they find that a one percentage point cut in average federal corporate income tax rates (measured as the ratio of aggregate federal corporate profit tax receipts to aggregate corporate profits) increased GDP by 0.4 to 0.6 percent in the short-run, but had no immediate impact on

employment or hours worked. Cuts increased private sector investment but had no impact consumption.

The two other studies analyzing the Kansas reform have focused on the business exclusion. DeBacker et al. (2016, 2017) analyze amounts reported in different categories on individual federal income tax returns. They are able to identify and find evidence of income shifting separate from real impacts. Turner and Blagg (2017) measure impacts on aggregate measures of employment and proprietors, but focus more narrowly on the base change impacts; namely on the business income exclusion.[6] They consider two outcomes (employment and proprietors) each measured three different ways (log, per capita, and growth rate), using two samples (all counties in the four border states and border county pairs along the Kansas border) and two pre-intervention periods (one beginning in 2004, the other in 2010). For all counties, starting in 2004, they find statistically significant negative impacts on log and per capita employment. Starting in 2010, estimated impacts for both remain negative but are not statistically significant. Estimated employment growth impacts are positive but not statistically significant. Their estimated level impacts for proprietors are all negative and not statistically significant.

3. Policy Change Details and Background

The 2012 tax legislation (HB 2117) was enacted in May of 2012, and became effective July 2012. Most (if not all) of the tax provisions were written to apply beginning in the 2013 tax year. Tax reform was identified as part of the political agenda at least as early as January 2011.[7] The 2012 legislation was followed with additional tax legislation in 2013, 2014, 2015, and 2017.

The reform decreased individual income tax rates for all taxpayers, collapsed the number of brackets from three to two, and increased the standard deduction for joint and head of household filers. For the top bracket, the rate dropped from 6.45 and 6.25 percent to 4.9 percent. For the lower bracket, the rate dropped from 3.5 to 3 percent. The new business income exclusion subtracted amounts reported on federal 1040 lines 12, 17, and 18 from

[6] They focus on base changes by controlling for the rate changes.

[7] For example, the Governors State of the State Address from January 2011 noted a tax policy agenda. ("And for all of this to work, we need a tax code that encourages investment, income growth, and job creation. I pledge to work with the Legislature on resetting our tax code, particularly with an eye toward lowering income tax rates. In general, my Administration's first priority will be creating jobs that provide more income and opportunity for Kansas families. ... The days of ever expanding government are over and under my administration, they will not return.")

income for the purposes of the state income tax. Those lines correspond to business income, rental real estate, royalties, partnerships, S corporations, trusts, and farm income. Revenue increasing measures reduced and eliminated a handful of credits and refunds, and provided for a gradual reduction (partial phase-out) in itemized deductions for individual taxpayers. The changes also eliminated a severance tax exemption.

As mentioned in the introduction, the 2012 reform did not substantively modify the corporate income tax. As a result, direct labor demand effects from the tax policy changes should be limited to only noncorporate entities (more precisely, to entities not taxed as corporate entities, including S-corporations). Noncorporate employment was approximately 38 percent of total employment on average from 2010 to 2012 in Kansas (County Business Patterns, annual state-wide numbers).

A series of top corporate income rate cuts were phased in from 2008 to 2011. The top corporate income rate dropped from 7.35 to 7.1 percent for 2008, then to 7.05 percent for 2009 and 2010, and finally to 7 percent for 2011 and beyond. Corporate franchise tax rate reductions were phased in over the same period, and the applicability threshold was increased. If those corporate tax changes, taking effect from 2008 to 2011, affected economic activity (relative to control groups), they will confound difference-in-differences estimates of the 2012 reform's impact on that activity.

4. Empirical Approach

I estimate impacts of the Kansas tax reform on output, employment, and establishments using the synthetic control method (SCM). The SCM is introduced in Abadie and Gardeazabal (2003), and expanded on by Abadie, Diamond and Hainmueller (2010, 2015). In the tax policy context, it has been used to evaluate impacts of flat tax reforms (Adhikari and Alm 2016). The SCM is particularly well suited for examining impacts of a single policy intervention on aggregate outcome variables. It also removes some of the arbitrariness involved in selection control units. This section introduces the empirical framework and synthetic control estimation.

A synthetic control is a weighted average of outcome values from a set of potential control units. The set of potential control units is referred to in the literature as the "donor pool." Using a set of predictor variables, weights are assigned to each state in the donor pool so that the resulting synthetic control matches the treated state as closely as possible during a pre-intervention period. The following framework described is based on Abadie, Diamond and Hainmueller (2010).

States $s = 1, \ldots, S+1$, are observed for time periods $t = 1, \ldots, T$. The first state ($s = 1$) is Kansas (or more generally the treated state). The S remaining states form the donor pool. The policy change of interest occurs at time $T_0 + 1$, so that $t = 1, \ldots, T_0$ indexes the pre-intervention period, and $t = T_0 + 1, \ldots, T$ indexes the post-intervention period. Y_{st} denotes the outcome of interest for state s at time t. The effect of the policy intervention for unit s at time t is specified in a potential outcomes framework as $\alpha_{st} = Y_{st}^T - Y_{st}^0$, where Y_{st}^0 denotes the outcome that would be observed without the intervention.

$$Y_{st} \;=\; Y_{st}^0 + \alpha_{st} D_{st},$$

where

$$D_{st} \;=\; \begin{cases} 1 & \text{if } s = 1 \text{ and } t > T_0 \\ 0 & \text{otherwise.} \end{cases}$$

Each state in the donor pool is assigned a non-negative weight w_s, such that the combined weights for all states in the donor pool sum to one. The weights collectively form a $(S \times 1)$ vector W. The weights defining a given synthetic control W^* are chosen to minimize:

$$||X_1 - X_0 W||_V \;=\; \sqrt{(X_1 - X_0 W)' V (X_1 - X_0 W)},$$

where X_1 is a vector of predictor variables for the treated unit, X_0 is a matrix containing the same predictor variables for each of the donor pool units, and V is a symmetric, positive semidefinite matrix of weights assigned to the predictor variables. The predictor variable weights are assigned to reflect the relative importance of each predictor variable in predicting the outcome of interest. This can be done in different ways.[8] I solve for both the donor pool and predictor variable weights using the Synth package in R.

Given W^* and a matrix Y_0 containing the outcome variable values for each donor pool unit in each time period, the counterfactual outcome path is $Y_1^* = Y_0 W^*$. The estimated policy impact is given by the difference between that counterfactual outcome path and the observed values for the treated unit following the policy intervention. Dynamic treatment

[8] Abadie and Gardeazabal (2003) select predictor variable weights such that the outcome variable path for the treated unit during the pre-intervention period is best reproduced by the resulting synthetic control. Abadie, Diamond and Hainmueller (2015) apply a cross-validation method to choose the predictor variable weights.

effects for year $t \in \{T_0 + 1, \cdots, T\}$ are given by:

$$\hat{\alpha}_{1t} \;=\; Y_{1t} \;-\; \sum_{s=2}^{S+1} w_s^* Y_{st},$$

where, as indicated above, $s = 1$ is Kansas, $s \in \{2, \cdots, S+1\}$ are the donor pool states, and T_0 is the number of pre-intervention years. The average treatment effect (ATE) is given by:

$$ATE \;=\; \frac{1}{T \;-\; T_0} \sum_{t=T_0+1}^{T} \hat{\alpha}_{1t}.$$

Outcomes in both the treated state and donor pool states are assumed to follow a linear factor model:

$$Y_{st}^0 \;=\; \delta_t + \theta_t Z_s + \lambda_t \mu_s + \varepsilon_{st},$$

where Y_{st}^0 is the outcome absent the intervention, δ_t are unknown common factors with constant loadings across states (common time effects), θ_t is a vector of unknown loadings (parameter), Z_s are observed covariates not affected by the intervention, λ_t are unobserved common factors, μ_s are unknown factor loadings, and ε_{st} are unobserved, mean zero, state level transitory shocks. When $\lambda_t = 1$ and $\mu_s = \delta_s$, the model simplifies to a two-way fixed effects model.

Unlike difference-in-difference estimates, synthetic control estimates allow for time varying heterogeneity in unobserved variables (i.e., do not require the parallel trends assumption). Abadie, Diamond and Hainmueller (2010) show this in the context of the above specified model. When the number of pre-intervention periods is large relative to the size of the error, the bias from time varying heterogeneity approaches zero. Additional identification assumptions include that untreated donor pool states are not affected by the same intervention (no spillover effects) or by similar interventions, and that the intervention has no effect on the outcome before being implemented (no anticipation effects).

To minimize the potential for biased estimates, I use a ten year pre-intervention period. To eliminate anticipation effects, I do not include 2012 in the pre-intervention period when finding synthetic control weights.[9] Because the policy had not yet taken effect, I also do

[9] The legislation was enacted by mid 2012. At that point the changes were certain. While it did not become effective until 2013, people may have started changing their status or behavior in

not include 2012 in calculating treatment effects. At the state-level, spillover effects are not expected to be substantial. To eliminate states affected by similar interventions from the donor pool, as described in the next section, I impose a restriction based on top marginal income tax rate changes.

Not all states will be well matched by synthetic controls. For example, if Kansas had observed outcome values strictly greater than all donor pool state values, the Kansas values would not be reproducible as a convex combination of the donor pool values. There is also a risk of interpolation bias if states in the donor pool are not similar enough to the treated state (Abadie, Diamond and Hainmueller 2010). Graphical results are presented to facilitate evaluation of the match. Additionally, following Abadie, Diamond and Hainmueller (2015), I compute the root mean square prediction error (RMSPE) over the pre-intervention period as a measure of goodness-of-fit. The formula is:

$$RMSPE \;=\; \sqrt{\frac{1}{T_0}\sum_{t=1}^{T_0}\left(Y_{1t} \;-\; \sum_{s=2}^{S+1} w_s^* Y_{st}\right)^2}\,.$$

A disadvantage of the synthetic control method is the lack of formalized inference. Placebo methods are used instead. Placebo tests are run for every state in the donor pool. A synthetic control is constructed for each state yielding a distribution of placebo effects. Donor pool states, having not been subject to the intervention, should not have large estimated treatment effects. The distribution of placebo effects is used to calculate empirical p-values for average and dynamic treatment effects. The formula used is:

$$p_1 \;=\; \frac{\sum_{s=2}^{S+1}\{\hat{\alpha}_s \geq \hat{\alpha}_1\}}{S}.$$

These values indicate the chance of estimating an effect as large as that actually estimated. The procedure used largely follows Abadie, Diamond and Hainmueller (2010), with the exception that I do not include Kansas (the treated state) in the donor pool for the placebo synthetic controls.

Placebo estimates that do not fit well in the pre-intervention period are not expected to fit well in the post-intervention period. Further they are not expected to be informative

anticipation of the policy during 2012. For example, employees wanting to change status to an independent contractor could have done so during the end of 2012, so as to benefit immediately once 2013 began.

of the chance of estimating an effect as large as that estimated for a state with a closer pre-intervention fit. To adjust for this, thresholds based on pre-intervention can be used as restrictions. Abadie, Diamond and Hainmueller (2010) produce multiple sets of placebo tests using three different cutoffs, excluding states with a pre-intervention MSPE of: (i) more than 20 times the treated state MSPE, (ii) more than 5 times the treated state MSPE, and (iii) more than twice the treated state MSPE. An alternative, that avoids choosing a cutoff, is to look at the ratio of the post to pre intervention MSPE, as is done in Abadie, Diamond and Hainmueller (2015). This is the approach I follow. For each state in the donor pool, I compute a placebo RMSPE ratio:

$$Ratio_{si} \;=\; \frac{RMSPE_{Post,si}}{RMSPE_{Pre,si}} \;=\; \frac{\sqrt{\frac{1}{T-(T_0+1)}\sum_{t=T_0+1}^{T}\left(Y_{si,t} \;-\; \sum_{s\neq si}^{S+1} w_s^* Y_{st}\right)^2}}{\sqrt{\frac{1}{T_0}\sum_{t=1}^{T_0}\left(Y_{si,t} \;-\; \sum_{s\neq si}^{S+1} w_s^* Y_{st}\right)^2}}.$$

Ratio values for each state are used to rank the treated state and calculate an empirical "p-value."

Placebo tests cannot rule out the possibility that the estimated impact is driven by another cause. Specifically, they cannot rule out the presence of idiosyncratic shocks or other policy changes. The placebo method does not reflect this source of uncertainty. While the SCM is said to be a more "data driven" approach, and in some senses is, it still requires selecting donor pool members, predictor variables, and the pre-intervention period to use in optimizing weights. Each of these selections presents an opportunity for difficult and possibly arbitrary decisions that could end up driving analysis results.

Difference-in-differences estimates are based on the following standard model,

$$Y_{st} = \alpha\ (KS_s \times Post_t) \;+\; u_s \;+\; v_t \;+\; \epsilon_{st},$$

where α is the policy treatment effect, Y_{st} is the outcome variable, u_s are state fixed effects (which absorb state level differences that remain constant over the period examined), and v_t are time fixed effects (which absorb differences over time that effect the states in the same way). KS_s is an indicator equal to one for Kansas. $Post_t$ is an indicator equal to one for observations in 2013 or later. Identifying assumptions include that the treated and control states follow parallel trends in the outcome variable, no spillover effects, and no anticipation effects.

The difference-in-differences analysis uses a control group primarily based on geographic proximity. Four states border Kansas: Colorado, Missouri, Nebraska, and Oklahoma. I use Iowa, Missouri, Nebraska, and Oklahoma, in essence replacing Colorado with Iowa.[10] Anecdotally, Kansas and Colorado are expected to differ in a number of important respects. Colorado is a popular tourist destination with winter and summer attractions. Kansas is not. Additionally, legalization of marijuana for recreational use, a potentially important positive economic shock, became effective in Colorado at the end of 2013.

5. Data

This section introduces the data and samples used in the empirical analysis. Analysis is done at the state-year level from 2001 to 2015.[11]

5.1. Outcome Measures

Real gross state product (RGSP) is from BEA's Annual Gross Domestic Product by State data. Positive impacts from tax cuts could be directly offset in RGSP by accompanying decreases in government spending. To evaluate this, I adjust RGSP by subtracting off the public sector component. In Kansas, the pubic sector accounted for approximately 15.1 percent of annual RGSP on average from 2000 to 2011. Results are reported for both the original and adjusted measures.

Employment is from the BEA State Personal Income accounts. It includes wage and salary employment, as well as proprietor employment. It also includes farm employment, an important sector in Kansas that is not included in all measures of employment.

Establishment data is from the US Census County Business Patterns (state-level files). A separate measure of establishments, establishments with no employees is also considered.

[10] Admittedly, this makes the control group selection more ad-hoc than it would be relying solely on geographic proximity and selecting the bordering states. However, comparing means of each outcome variable for Kansas, the border state group, and the adjusted version demonstrates that the adjusted version is more similar to Kansas than the border version.

[11] Following Abadie, Diamond and Hainmueller (2010) and others, I use ten years of pre-intervention data: from 2001 to 2011. Longer time periods should reduce the potential bias from time-varying unobservable effects (as described above, this source of bias approaches zero as the pre-intervention period increases). As explained above, 2012 is not included in the pre-intervention period due to concern about anticipation effects. The reform was fully enacted by the middle of 2012, leaving time for taxpayers to plan for and potentially change activity in anticipation of the changes taking effect.

Nonemployer establishments data is from the US Census Nonemployer Statistics (NES). Nonemployers are not counted in either establishments or employment.

5.2. Predictor Variables

Predictors variables used in constructing synthetic controls vary some by outcome but mostly overlap. The specific predictors for each outcome and resulting weights are reported with results. They include sector shares, demographic, labor market, and human capital measures, which are related to economic growth and similar to predictor variables included in other studies (Abadie and Gardeazabal 2003; Abadie, Diamond, and Hainmueller 2015). Sector shares are calculated based on RGSP. Population, gender, age, and population density data are from the Census. Unemployment rate, labor force participation rate, education, and workforce skill level data are from individual-level Current Population Survey microdata, aggregated to the state-year level. Several, but not all, lags of the outcome variables are included. Alternative approaches are to include the average, or the last observed value.

5.3. Donor Pool

The donor pool is selected from the 50 US states. States without individual or corporate income taxes are excluded, as are states that had, in a single year, corporate or individual income rate changes at or above a one percentage point threshold.[12] Policy thresholds have been used in other contexts to decide which groups to include in a donor pool.[13] Louisiana is also excluded. The top rate in Kansas dropped by 1.55 beginning in 2013, well above the threshold. By contrast, none in the series of small corporate income rate cuts between 2007 and 2011 exceed this threshold. Nor do any of the small individual rate cuts that took effect in Kansas after 2013.

From 2001 to 2015, 105 changes in top individual income rates (77 decreases and 28 increases), and 80 changes in top corporate income rates are observed. Decreases were more frequently observed, but increases were more likely to exceed one percentage point. 15.58

[12] State data on the top corporate income tax rate, the top individual income tax rate, and the sales tax rate for 2000 to 2015 are from the Tax Foundation. The rate data is not perfect. For example, in the case of Kansas it leaves out the decrease in the top corporate income tax rate from 7.35 percent to 7.1 percent taking effect in 2008.

[13] For example, in considering the impact of a large scale tobacco control program implemented in California, ADH 2010 used having had a state per pack cigarette tax increase of 50 cents or more as a threshold for excluding states.

percent of the individual and 25 percent of the corporate rate decreases were one percentage point or higher.[14] 39.29 percent of the individual and 60 percent of the corporate rate increases were one percentage point or higher.[15] These exclusions leave a baseline donor pool of Arkansas, Colorado, Georgia, Idaho, Iowa, Massachusetts, Maine, Mississippi, Missouri, Nebraska, Oklahoma, Pennsylvania, South Carolina, and West Virgina. Figure 2 shows Kansas in gray and each of the donor states in blue.

6. Empirical Results

This section describes the empirical results. The results for the first outcome, RGSP per capita, are explained in greater detail than the others. Similar explanations hold for other outcomes. Tables 1 and 2 report donor pool and predictor weights for the three baseline outcomes (real GSP per capita, employment, and establishments). Table 3 reports pre-intervention averages in KS, the donor pool states, and for the weighted synthetic control for each outcome.

6.1. Real Gross State Product Per Capita

Figure 3 presents results for RGSP per capita in four graphs. Figure 3(a), shows actual RGSP per capita in Kansas (in blue) and for the estimated synthetic control for Kansas (in gray). The dashed vertical line (in red) marks the beginning of 2013. The difference between the synthetic control and Kansas before 2013 indicates how well the synthetic control fits, with a closer match indicating a better fit. The gap between the synthetic control and Kansas after 2013 is the estimated policy impact. Figure 3(b) plots the gap between Kansas and the synthetic control. The gap indicates that RGSP per capita decreased following the tax cuts relative to the synthetic control. However, the timing of the divide between Kansas and its synthetic raises a question about whether the gap is driven by something other than the policy intervention. Furthermore, large gaps between Kansas and the synthetic control prior to the policy changes raise a question about how well the synthetic control fits this Kansas data. Figure 3(c) shows the placebo analysis results. For each state in the donor pool, the gap between the observed state data its synthetic control is shown in gray. The gap for Kansas is shown in blue. After the policy change, Kansas lies below all but one other state. Figure 3(d) plots the post to pre RMSPE ratio for Kansas and all other states in

[14] Respectively, 12 out of 77 and 15 out of 60.
[15] Respectively, 11 out of 28, and 12 out of 20.

the donor pool. Two states have values greater than Kansas. Table 4 reports the estimated treatment effects, pre and post RMSPE, ratio, and p-value. The average treatment effect is approximately negative 2,999 per capita. This is economically substantial - almost $3,000 per person, per year. However, the number is not statistically significant applying the ratio test of Abadie, Diamond, and Hainmueller (2015).

Excluding the public sector component of RGSP makes little difference. Figure 4 compares the total RGSP (solid lines) and private sector (dashed lines) results. The private sector results closely mirror overall results. Table 4 includes estimates for the private sector version.

6.2. Employment

Graphical results for total employment are presented in Figures 6(a) through 6(d). Figure 6(a) suggests total employment in Kansas declined following the tax cuts relative to the synthetic control. The ratio distribution indicates that this result is significant at a ten percent level. However, again the gap appears to begin before 2013. Figures 7(a) and 7(b) show results for the proprietor and the wage and salary components of total employment. Figure 7(b) shows a negative and significant impact on wage and salary employment similar to that observed for total employment. Figure 7(a), however, shows a positive impact on proprietor employment. The results are summarized in Table 5. As a robustness check, results for a second measure of employment is also included in Table 5. The second measure is from Census County Business Patterns data. It does not include agriculture, government, or self-employment. Results are similar to those from the primary measure, although are not significant. The dynamic treatment effects move in different directions as compared to the primary employment measure. This could reflect heterogeneous impacts in industries not included in the later measure. Graphical results for the later measure are presented in Figures 8(a) through 8(d).

6.3. Establishments

Figures 9(a) through 9(d) show the synthetic control results for establishments. The results indicate that the number of establishments declines relative to the synthetic control, although the gap appears to begin prior to the tax cuts. Based on the ratio distribution, the result is not significant. Figures 10(a) through 10(d) show synthetic control results for nonemployer establishments, which are not included in the establishments measure. Nonemployer establishments are businesses with no payroll and at least $1,000 in annual revenue.

The results indicate a positive but not significant impact on nonemployer establishments similar to that observed for proprietor employment. Table 6 reports estimated treatment effects, RMSPEs, ratio, and p-values for both establishments and nonemployer establishments.

7. Conclusion

Results indicate that the Kansas tax experiment did not have the impact politicians had hoped for. Overall the results suggest that the reform did not have a positive impact on state-level economic outcomes. They indicate potentially negative impacts on the three main outcomes considered. The findings are largely consistent with those in other papers looking at the same Kansas tax reform (DeBacker et al. 2017; Turner and Blagg 2017). The results are also consistent with empirical findings that tax cuts are less effective during expansionary phases of the business cycle (Ljungvist and Smolyansky 2014). They are less consistent with expectations based on economic theory, which suggests some channels through which a tax cut could have negative impacts on economic activity, but more generally associates tax cuts with positive impacts.

I find evidence of positive impacts on proprietor employment and on nonemployer establishments. This is consistent with individuals and firms restructuring economic activity, as suggested in DeBacker et al. (2017). It is also consistent with expansionary activity, in the form of individuals starting new businesses, and with the policy having had a positive impact on small businesses.

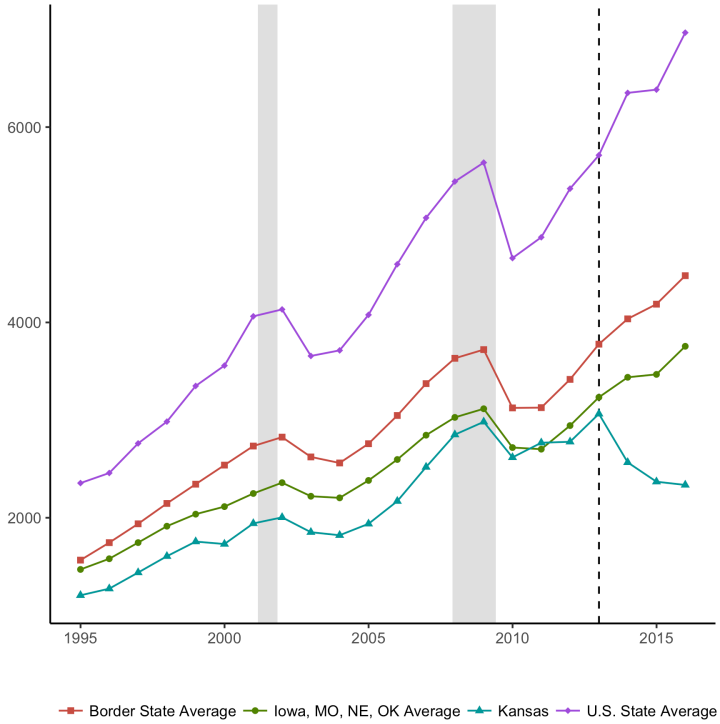
A limitation of the method used is that it cannot rule out the possibility that other changes at or around the same time caused the observed differences in outcomes relative to synthetic controls. Some of the synthetic control graphs suggest that there may have been an impact from prior to the tax reform taking effect, particularly in 2010 or 2011. Factors exogenous to tax policy, occurring around the time of or after the reform, could have influenced the observed results. Around 2013, a large manufacturer in the aviation industry relocated to another state. The firm had more than 2,000 employees in Kansas when it announced its relocation (The Wichita Eagle 2014). It is unlikely that the relocation was related to the tax reform, though it would have directly and indirectly impacted economic activity in the state around the same time. Exogenous volatility in energy markets and changes in the agricultural sector could also have impacted results.

Analysis of private sector measures of RGSP and employment suggest that the results are not directly explained by a corresponding decline in government spending. However, indirect effects of decreasing government spending could have influenced results. Subsequent

tax changes, such as the state sales tax increase, could also have influenced results.

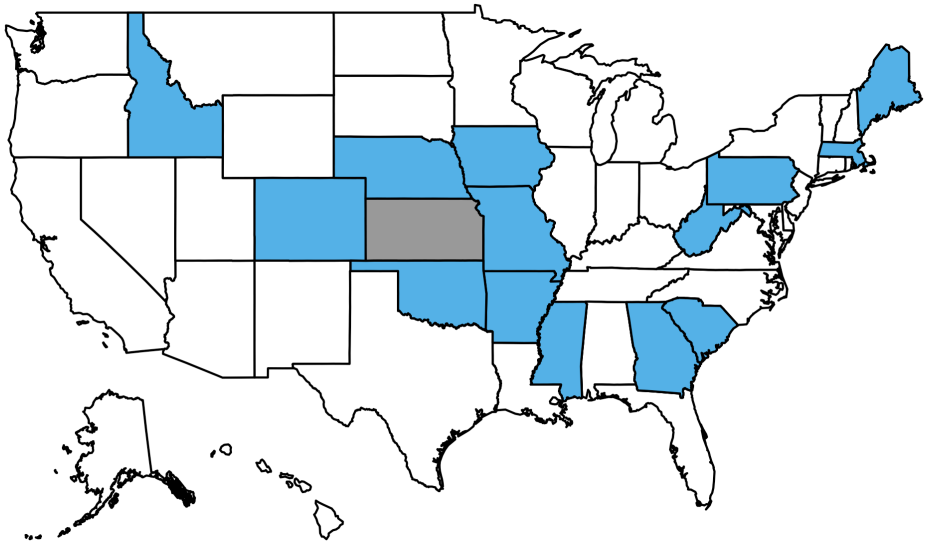
8. Tables and Figures

Figure 1: Individual Income Tax Revenue, Annual State Average (millions/year)



Dashed vertical line marks the beginning of 2013 (policy effective date). Source: U.S. Census Bureau and author calculation. Shaded areas reflect NBER recession dates.

Figure 2: Map of Donor Pool States



Gray = Kansas. Blue = donor pool states.

Table 1: Synthetic Control Weights

State	RGSP	Emp	Estab
Arkansas	0	0	.001
Colorado	0	0	0
Georgia	0	0	0
Idaho	0	.001	.062
Iowa	0	.005	.329
Massachusetts	0	.214	.252
Maine	.197	.190	.142
Mississippi	0	.001	.001
Missouri	0	0	.001
Nebraska	.103	.457	.138
Oklahoma	.700	.132	.003
Pennsylvania	0	0	.001
South Carolina	0	0	.001
West Virgina	0	0	.069

See text for additional details.

Table 2: Synthetic Control Predictor Weights

(a) Real GSP Per Capita		(c) Establishments	
Sector share 6	.209	Sector share 7	.245
Sector share 2	.159	Establishments, 2001	.207
Prime age male	.130	Middle skill workforce	.166
Bachelors or higher	.127	Prime age male	.136
RGSP per capita, 2003	.112	Sector share 1	.064
Population growth	.111	Employee compensation per capita	.064
RGSP per capita, 2008	.084	Establishments, 2009	.053
RGSP per capita, 2007	.023	Establishments, 2005	.030
Labor force participation rate	.013	Population density	.022
RGSP per capita, 2001	.013	Establishments, 2008	.013
Sector share 7	.007	High school or lower education	0
High school or lower education	.004	Bachelors or higher	0
Sales tax rate	.002	Labor force participation rate	0
Middle skill workforce	.002	Population growth	0
RGSP per capita, 2006	.002	Sector share 2	0
RGSP per capita, 2002	.001	Sector share 9	0
Population density	0		
Unemployment rate	0		
Sector share 1	0		
Sector share 3	0		
Sector share 4	0		
Sector share 5	0		
(b) Employment			
Bachelors or higher	.209		
Employee compensation per capita	.190		
Middle skill workforce	.182		
Sector share 1	.118		
Population density	.078		
Employment, 2001	.047		
Employment, 2005	.045		
Employment, 2011	.041		
Sector share 2	.038		
Prime age male	.034		
Employment, 2008	.015		
Labor force participation rate	.001		
Population growth	.001		
Employment, 2009	.001		
Sector share 7	0		
Sector share 9	0		
High school or lower education	0		

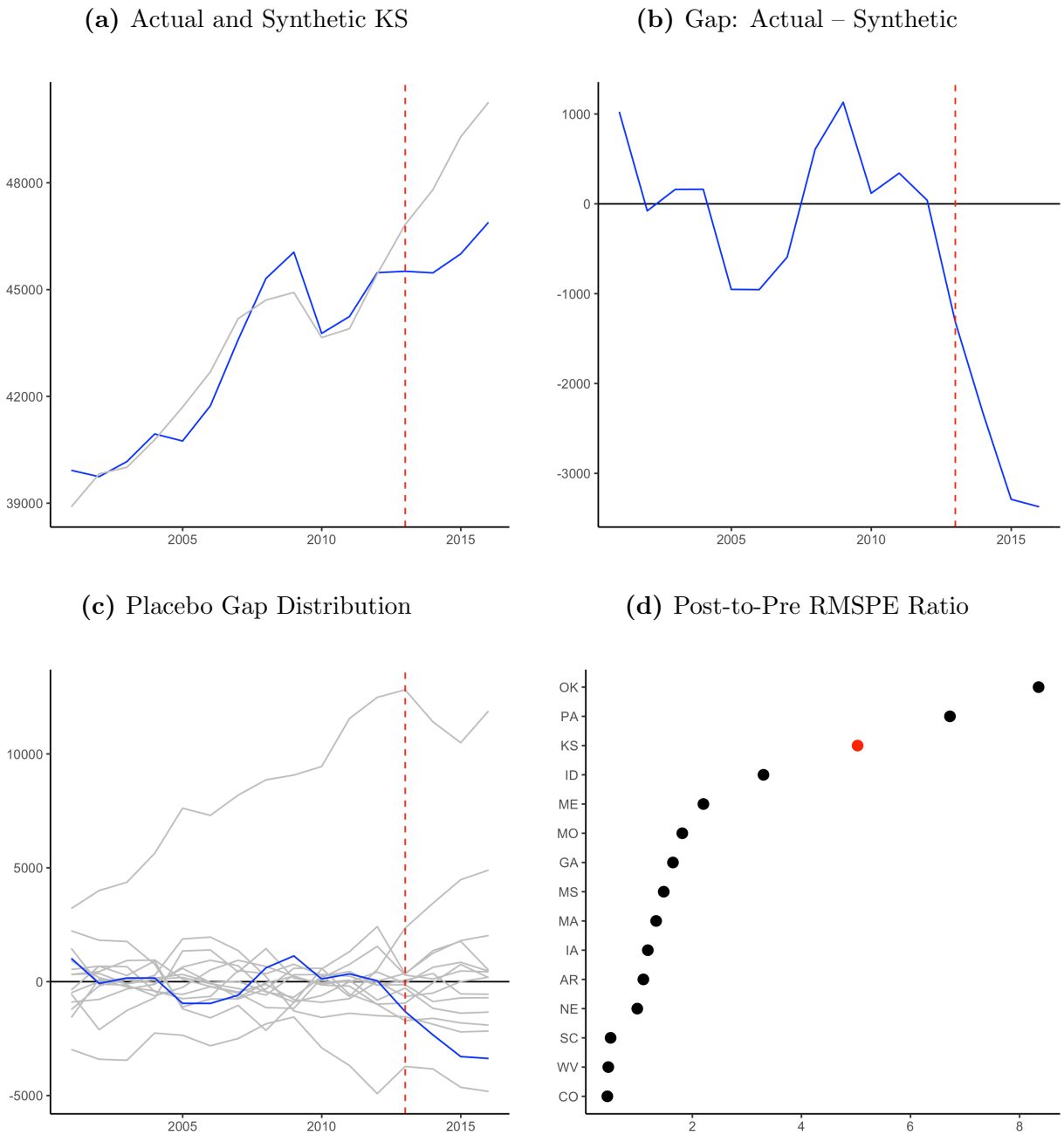
Baseline analysis variable weights. See text for additional detail.

Table 3: Predictor Variable Average Values

	Avg	KS	SC_{RGSP}	SC_{Emp}	SC_{Estab}
Pop Growth	0.806	0.573	0.717	0.556	0.499
Population density	0.019	0.03	0.018	0.028	0.023
Prime Male	20.544	20.32	20.41	20.545	20.426
Sector 1	4.16	3.96	8.74	4.29	3.83
Sector 2	5.12	4.32	4.41	4.73	4.83
Sector 3	13.10	15.91	10.96	-	-
Sector 4	18.31	19.30	17.11	-	-
Sector 5	3.77	5.22	3.24	-	-
Sector 6	16.88	14.62	15.81	-	-
Sector 7	9.80	8.55	9.78	10.62	8.75
Sector 9	3.66	3.05	-	3.38	3.43
High School/Lower	47.9	39.8	46.0	43.9	45.9
Bachelor/Higher	26.0	31.1	27.4	29.1	27.2
Middle Skill	45.1	43.7	44.4	43.7	44.3
Unemp Rate	6.0	5.6	5.1	-	-
LFPR	65.1	69.4	64.6	68.4	67.7
Empee Comp	21,470	22,732	-	24,019	22,629
Sales Rate	5.166	5.282	4.755	-	-
RGSP 2001	39,334	39,745	39,823	-	-
RGSP 2002	39,630	40,169	40,009	-	-
RGSP 2003	40,442	40,945	40,782	-	-
RGSP 2006	42,377	43,593	44,186	-	-
RGSP 2007	42,709	45,314	44,705	-	-
RGSP 2008	42,544	46,050	44,920	-	-
Emp 2001	2,498,662	1,767,584	-	1,760,015	-
Emp 2005	2,573,656	1,767,517	-	1,778,566	-
Emp 2008	2,684,307	1,861,559	-	1,851,232	-
Emp 2009	2,612,590	1,818,445	-	1,815,967	-
Emp 2011	2,636,823	1,820,268	-	1,829,061	-
Estab 2001	107,874	74,565	-	-	74,530
Estab 2005	113,044	76,173	-	-	76,017
Estab 2008	114,423	76,096	-	-	76,135
Estab 2009	111,951	74,698	-	-	74,596

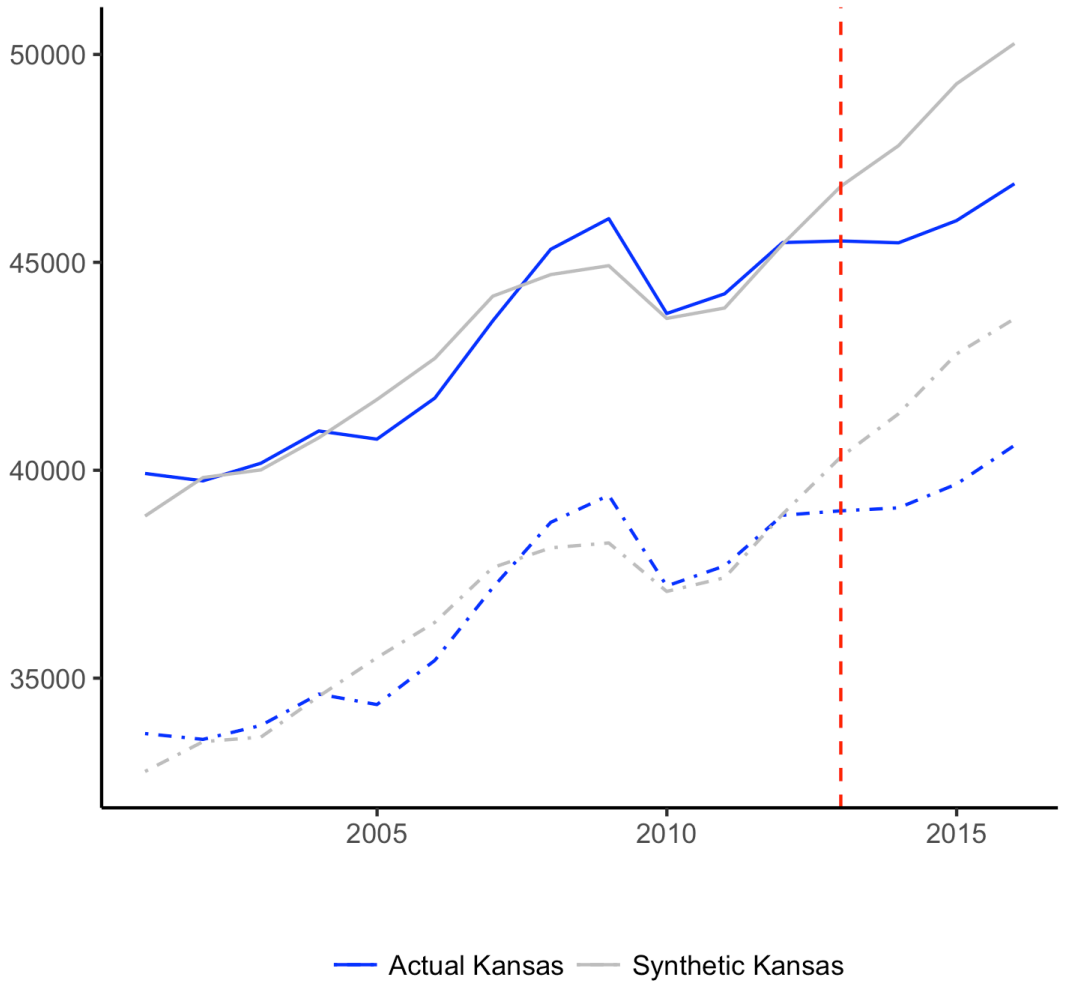
Avg = donor pool mean. SC values are weighted averages using donor pool weights. Weights are different for each outcome. See text for additional detail.

Figure 3: SCM Results for Real Gross State Product Per Capita



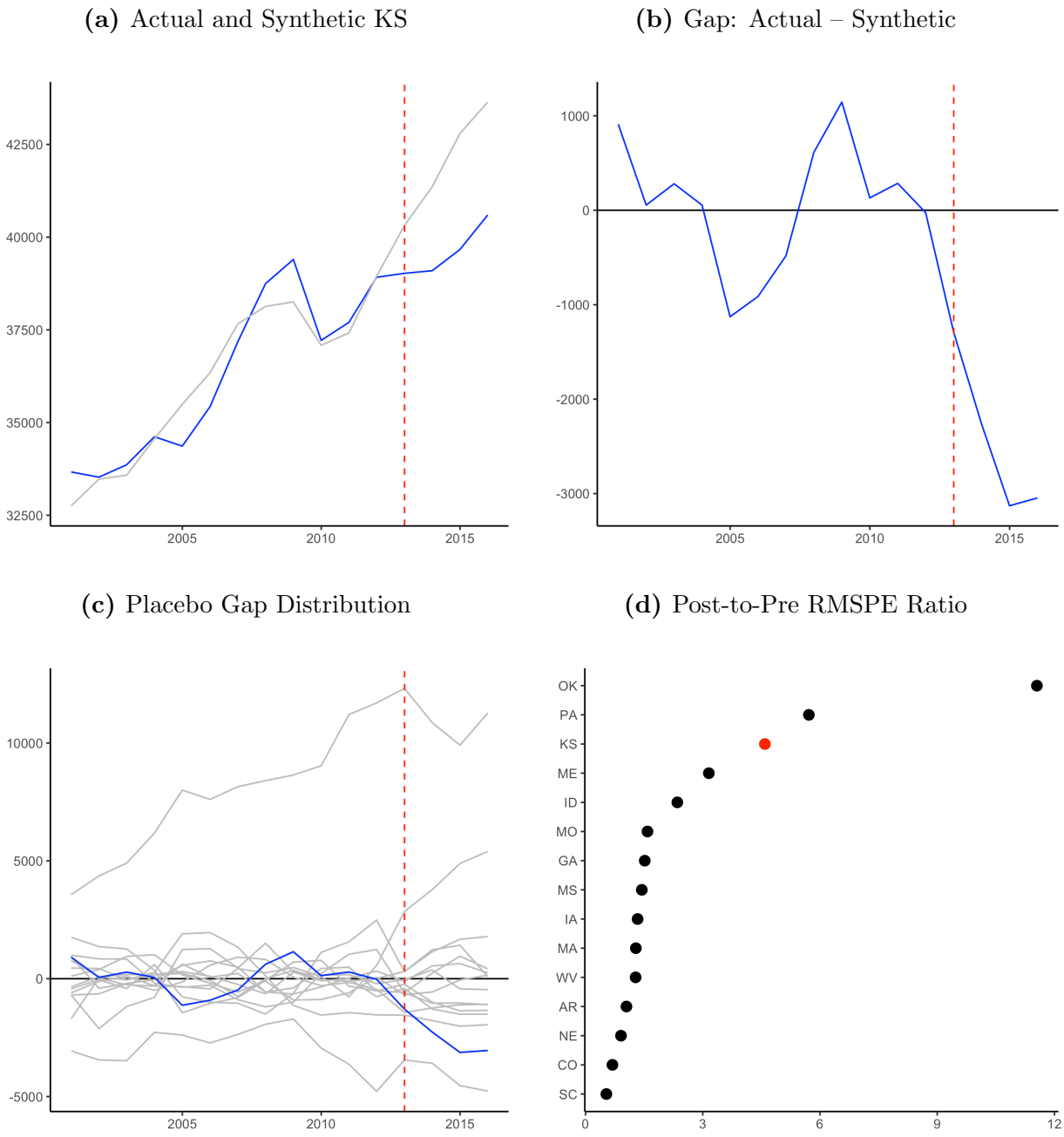
Dashed red vertical line marks the beginning of 2013 (policy effective date).
(a) Blue = Kansas data. Gray = synthetic control.
(c) Blue = gap between actual and synthetic for Kansas. Gray lines = gap between observed data and placebo synthetic control for each donor pool state.
(d) Post-intervention RMSPE calculated for 2013 to 2015. Pre-intervention RMSPE is calculated for 2001 to 2011.
Source: Annual Gross Domestic Product (GDP) by State, BEA and author calculation.

Figure 4: SCM Results for Private and Public Components of RGSP



Solid = total RGSP per capita. Dashed = private sector component.

Figure 5: SCM Results for Private Sector RGSP Per Capita



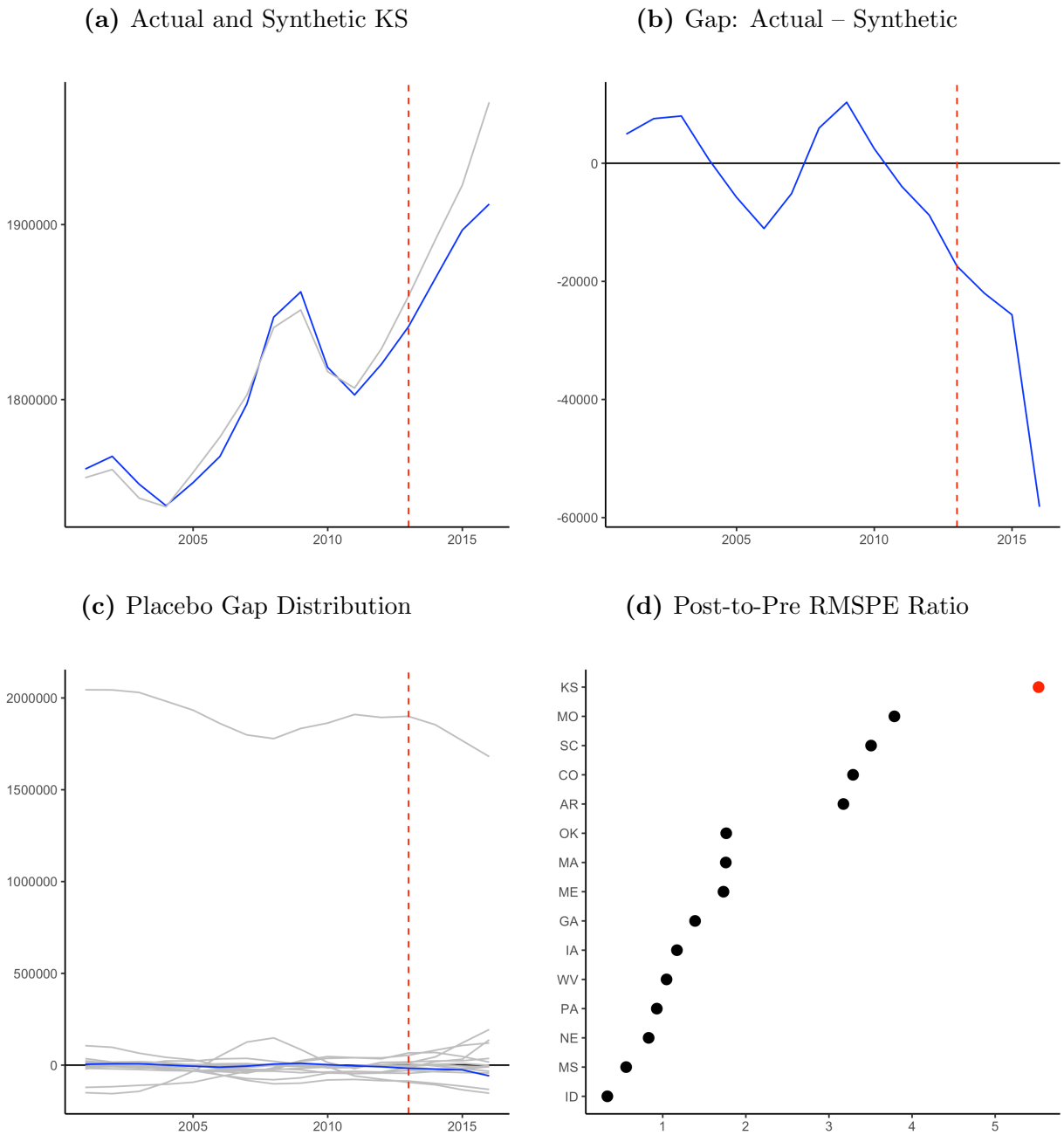
Dashed red vertical line marks the beginning of 2013 (policy effective date).
(a) Blue = Kansas data. Gray = synthetic control.
(c) Blue = gap between actual and synthetic for Kansas. Gray lines = gap between observed data and placebo synthetic control for each donor pool state.
(d) Post-intervention RMSPE calculated for 2013 to 2015. Pre-intervention RMSPE is calculated for 2001 to 2011.
Source: Annual Gross Domestic Product (GDP) by State, BEA and author calculation.

Table 4: RGSP Synthetic Control Results

	RGSP	Priv RGSP
Average Treatment Effect	-2,999	-2,813
Dynamic Treatment Effect		
2013	-2,337	-2,264
2014	-3,289	-3,128
2015	-3,372	-3,046
RMSPE		
Pre	604	619
Post	3,036	2,839
Ratio	5.03	4.59
Empirical RMSPE Ratio P-value	.2	.2

See text for additional detail.

Figure 6: SCM Results for Total Employment

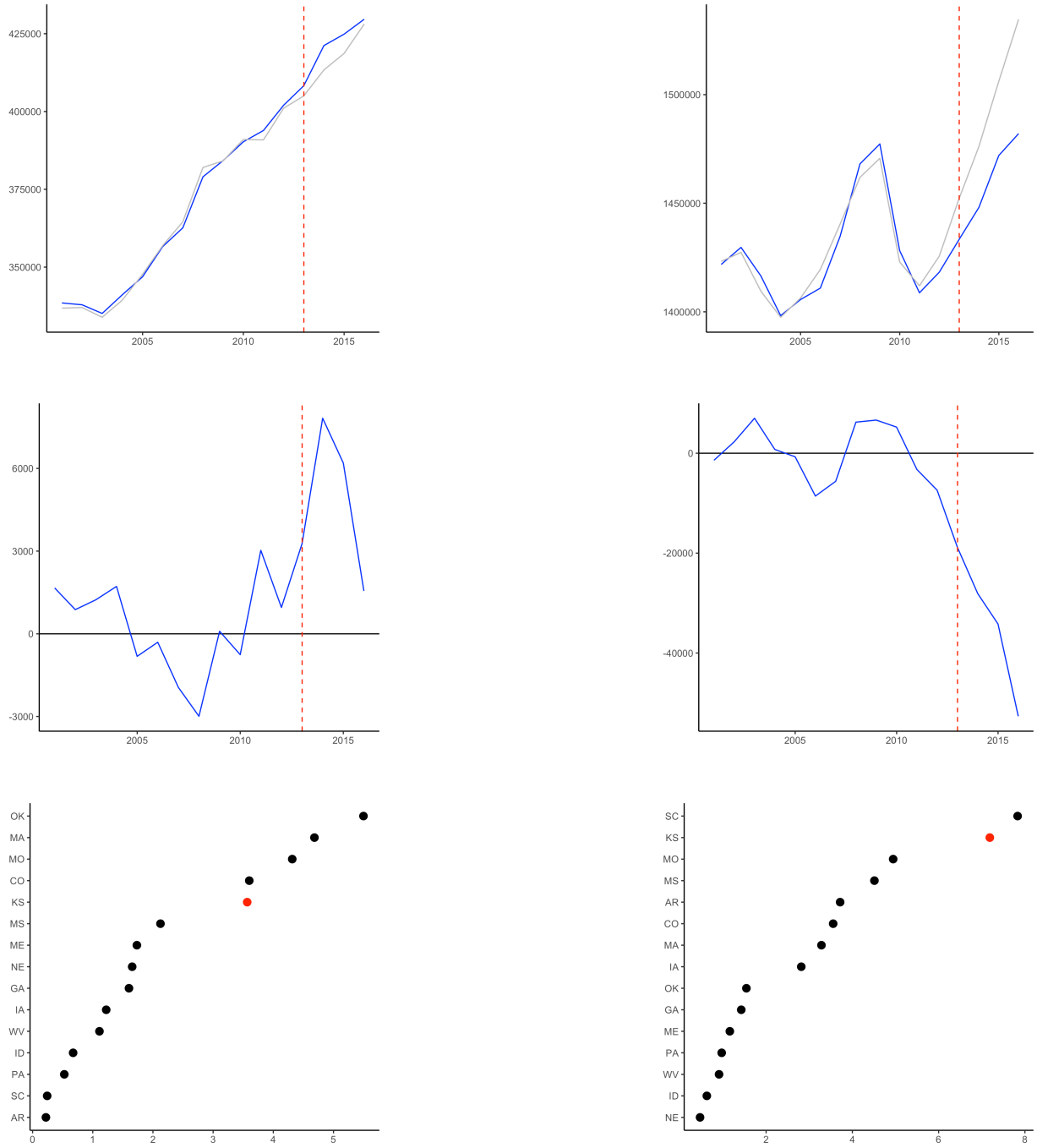


Dashed red vertical line marks the beginning of 2013 (policy effective date).
(a) Blue = Kansas data. Gray = synthetic control.
(c) Blue = gap between actual and synthetic for Kansas. Gray lines = gap between observed data and placebo synthetic control for each donor pool state.
(d) Post-intervention RMSPE calculated for 2013 to 2015. Pre-intervention RMSPE is calculated for 2001 to 2011.
Source: BEA and author calculation.

Figure 7: SCM Results for Components of Employment

(a) Proprietor Employment

(b) Wage & Salary Employment



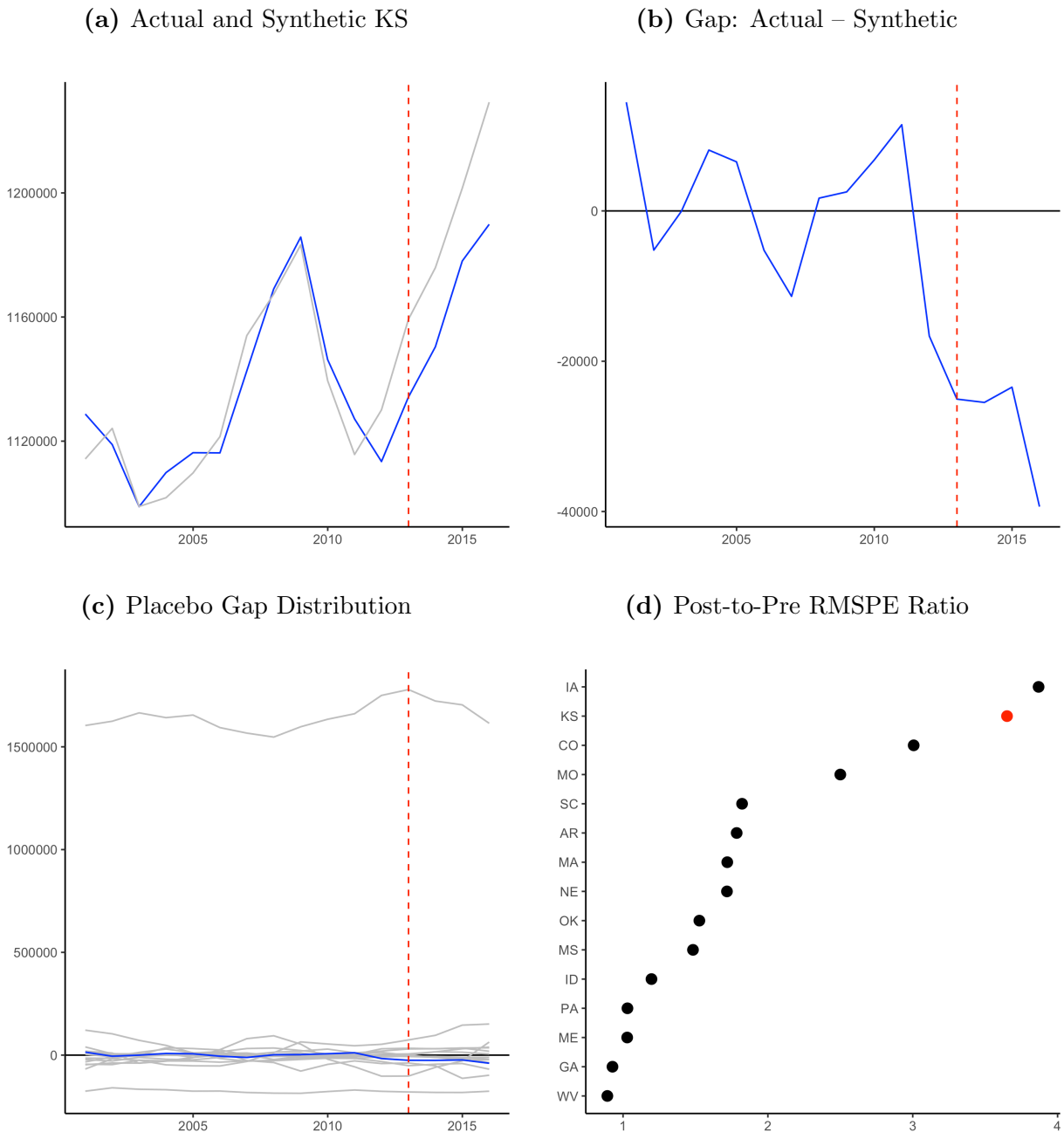
Dashed red vertical line marks the beginning of 2013 (policy effective date). (1) actual and synthetic comparison (blue = Kansas, gray = synthetic Kansas), (2) actual and synthetic gap, and (3) placebo analysis RMSPE ratio distribution. Source: BEA and author calculation.

Table 5: Employment Synthetic Control Results

	Total	Proprietor	Wage & Salary	CBP
Average Treatment Effect	-35,279	5,191	-38,314	-29,429
Dynamic Treatment Effect				
2013	-22,013	7,820	-28,094	-25,483
2014	-25,649	6,198	-34,186	-23,453
2015	-58,174	1,554	-52,662	-39,349
RMSPE				
Pre	7,034	1,635	5,526	8,289
Post	38,844	5,831	39,713	30,264
Ratio	5.52	3.57	7.19	3.65
Empirical RMSPE Ratio P-value	.067	.333	.133	.133

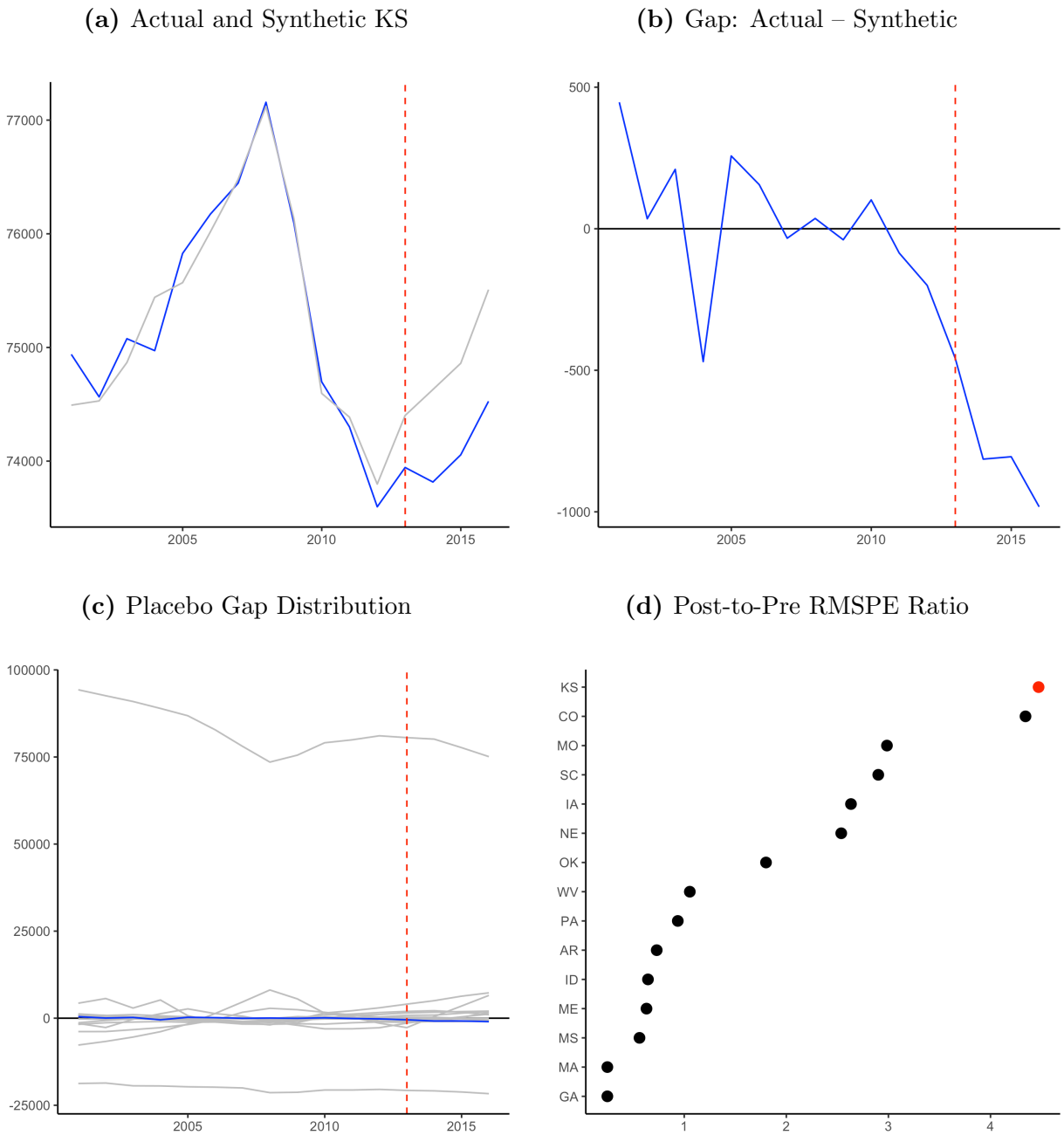
See text for additional detail.

Figure 8: SCM Results for CBP Employment



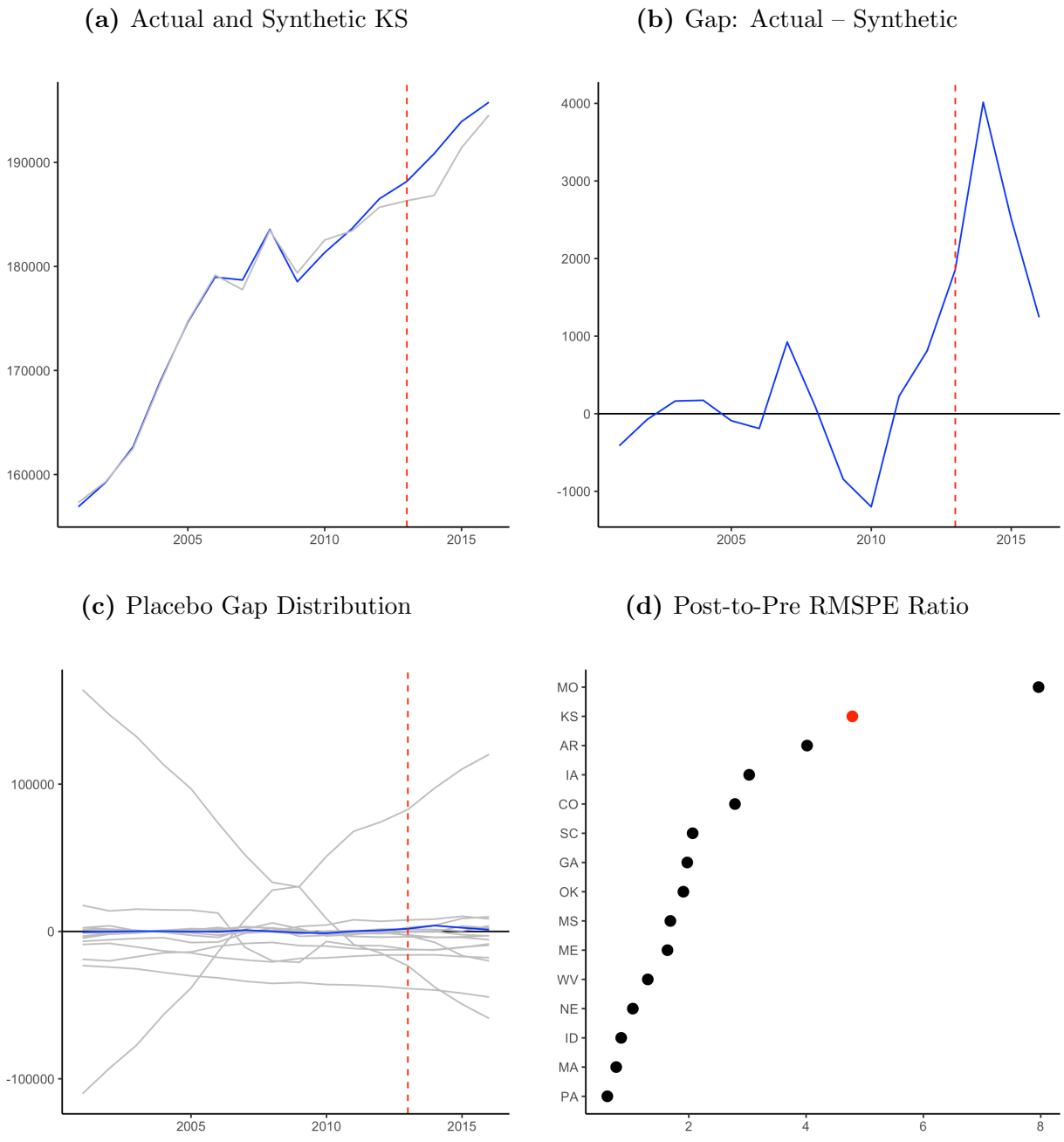
Dashed red vertical line marks the beginning of 2013 (policy effective date).
(a) Blue = Kansas data. Gray = synthetic control.
(c) Blue = gap between actual and synthetic for Kansas. Gray lines = gap between observed data and placebo synthetic control for each donor pool state.
(d) Post-intervention RMSPE calculated for 2013 to 2015. Pre-intervention RMSPE is calculated for 2001 to 2011.
Sources: County Business Patterns, U.S. Census.

Figure 9: SCM Results for Statewide Establishments



Dashed red vertical line marks the beginning of 2013 (policy effective date).
(a) Blue = Kansas data. Gray = synthetic control.
(c) Blue = gap between actual and synthetic for Kansas. Gray lines = gap between observed data and placebo synthetic control for each donor pool state.
(d) Post-intervention RMSPE calculated for 2013 to 2015. Pre-intervention RMSPE is calculated for 2001 to 2011.
Source: County Business Patterns, U.S. Census and author calculation.

Figure 10: SCM Results for Nonemployer Establishments



Dashed red vertical line marks the beginning of 2013 (policy effective date).
(a) Blue = Kansas data. Gray = synthetic control.
(c) Blue = gap between actual and synthetic for Kansas. Gray lines = gap between observed data and an estimated placebo synthetic control for each state in the donor pool.
(d) Post-intervention RMSPE calculated for 2013 to 2015. Pre-intervention RMSPE is calculated for 2001 to 2011.
Source: Nonemployer Statistics, U.S. Census.

Table 6: Establishments Synthetic Control Results

	Establishments	Nonemployer Estabs
Average Treatment Effect	-867	2,590
Dynamic Treatment Effect		
2013	-814	4,014
2014	-805	2,512
2015	-982	1,243
RMSPE		
Pre	195	590
Post	871	2,827
Ratio	4.47	4.79
Empirical RMSPE Ratio P-value	.067	.133

See text for additional detail.

Table 7: Difference-in-Difference Estimates

	RGSP	Emp	Est
$KS \times Post$	-1,216.2	-13,513.38	-3,120.35***
	(1,169.13)	(20,337.59)	(885.90)
$KS \times 2013$	-962.85	-11,779.79	-2,149.94***
	(955.95)	(22,131.35)	(725.32)
$KS \times 2014$	-1,535.58	-7,626.54	-3,075.69***
	(1,306.14)	(22,230.95)	(921.04)
$KS \times 2015$	-1,150.25	-21,133.79	-4,135.44***
	(1,307.21)	(19,149.29)	(1,497.51)
Observations	75	75	75
Average:			
R2	0.0218	0.0061	0.1046
Adjusted R2	-0.3161	-0.3373	-0.2047
F Statistic	1.227	0.3369	6.424**
Dynamic:			
R2	0.0229	0.0074	0.1134
Adjusted R2	-0.3643	-0.3859	-0.2379
F Statistic	0.4135	0.132	2.2601*

Robust standard errors reported in parenthesis. Estimated with state and year fixed effects. Estimated for 2001 to 2015, including state-level observations for IA, KS, MO, NE, OK. Dynamic and average effects estimated separately.

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