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

Jessica A. McCloskey[1]

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Abstract: This paper uses the synthetic control method (SCM) to empirically examine a major tax cutting reform targeted at job creation and economic growth. In 2012, Kansas cut taxes to create jobs. State tax collections sharply declined following the reform. Results from the SCM analysis and a difference-in-differences model, suggest that the tax reform did not have the strong impact expected 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 in the aggregate measure. There is also evidence of positive impact on the number of establishments without any employees.

1. Introduction

In 2012, Kansas enacted major tax reform, with primary goals of promoting economic growth and job creation.[2] The Governor described the reform as a

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[1] University of Kansas, Economics PhD Candidate, `jesmccloskey@gmail.com`, `jessicamccloskey.com`.

[2] Job creation was a major theme in promoting the new tax package, with an emphasis on small and new businesses. 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." More specifically, 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." (Media Release, Kan. Office of the Governor, May

"real live experiment" and predicted it would be "like a shot of adrenaline into the heart of the Kansas economy."[3] 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 farming incomes from the state income tax.[4] Both major facets took effect at the start of 2013. Corporate income taxes did not change. The 'experiment' was legislatively shut down in 2017.

Initial estimates from the Kansas Legislative Research Department, were that the reform 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.[5] The six-year total estimated net lost revenue was $4,539.1 million. 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.[6] Following the reform, individual income tax collections in Kansas sharply decline, while comparison group means continue to rise. Figure 2 shows that total tax revenue also initially declines, though not as sharply. From 2012 to 2013, individual income tax revenue declined 19.361 percent while total tax revenue declined 4.486 percent.

22, 2012, `https://governor.ks.gov`). The time frame for those projections was not provided in the release, but appears to have been by 2020.

[3] MSNBC Morning Joe interview June 19, 2012.

[4] 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).

[5] Numbers are the total expected impact on State General Fund receipts reported in Kansas Legislative Research Department (2012).

[6] 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 reform 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.[7]

Evaluating the effectiveness of the Kansas tax reform is important. Job creation and economic growth are politically and economically important objectives. Politicians are often tempted to use tax breaks in pursuing those objectives. This makes it important to understand what types of tax breaks might be useful tools in different settings. The 2012 Kansas tax reform in particular serves as a useful case study for a number of reasons. It was politically framed as an experiment, drawing it into the public eye. It enacted large changes taking effect in a single year, making it more like an adrenaline shot than reforms gradually phased in over a number of years. And it was primarily motivated by political ideology, not prospective economic conditions.

This paper uses the synthetic control method (SCM) to analyze real gross state product (RGSP) per capita, employment, and the number of establishments in Kansas following the reform. The SCM constructs a counterfactual

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[7] 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.

comparison state composed of a weighted average of states in a pool of potential control states. Weights are assigned to potential control states so as to match the treated state as closely as possible prior to the reform.

Results from the SCM analysis and difference-in-differences model, do not show a positive impact from the tax reform 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, suggesting that reduced government spending is not offsetting a positive impact. 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 in the aggregate measure. There is also evidence of positive impact on the number of establishments without any employees.

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. Appendix A provides additional detail regarding the policy changes. Appendix B provides additional detail regarding variable definitions and the data used.

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, but 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.

In terms of underlying mechanisms, tax changes could have direct impacts on labor demand and labor supply. They could also impact aggregate demand. Those in turn could impact employment and output. Potential distortionary effects could also impact employment and output.

Favorable tax conditions might attract more firms to locate or relocate in a region. They might also attract more individual migration into a region, or reduce migration out of a region. Looking at initial location decisions and differences in tax conditions across borders, Rohlin, Rosenthal and Ross (2014) find that state-level tax policies do affect firm decisions, but that the impacts are complicated. In particular, they find that state agreements regarding tax treatment of out of state workers have a significant impact. Looking at relocation decisions of multi-state firms, Giroud and Rauh (2015) find that increases in state tax rates decrease the number of establishments per state, number of employees, and amount of capital per plant. Their results indicate that pass-through entities are less responsive than corporations. They attribute about half of their estimated tax change responses to existing firms relocating to lower tax states.

Kansas Tax Changes.

Two other studies look at impacts of the 2012 Kansas tax reform. DeBacker et al. (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. The findings in this paper for nonemployer establishments and proprietor employment at the state-level are consistent with their individual-level findings. Their findings suggest that at least some of the increases I observe are likely attributable to individuals changing status to take advantage of preferential tax treatment without any

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corresponding change in underlying activity.

Turner and Blagg (2017) is more similar to this paper in that both directly measure impacts on aggregate measures of employment and proprietors, however, they focus more narrowly on the base change impacts; namely on the business income exclusion (and other miscellaneous base changes, such as those stemming from eliminated tax credits).[8] 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.

The findings in Turner and Blagg (2017) of no impact on employment are consistent with the findings of this paper. Evidence of a positive impact on proprietors and nonemployer establishments found in this paper differ from their findings. Possible explanations for the difference could be different units of analysis (they focus on county-level impacts, while I focus on state-level), different counterfactual comparisons, or their more narrow focus on the base change. The slightly positive impact on proprietors and nonemployer establishments found in this paper is consistent with the evidence of income shifting found in DeBacker et al. (2017).

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

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.[9]

3.1. The 2012 Kansas Tax Reform

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 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. Additional details can be found in Appendix A. Overall, the changes seem quite regressive.

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[9] 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.")

3.2. Initial Problems and Subsequent Changes

The bill, with modifications, passed in somewhat of a haste. The resulting text left some open questions. One was whether LLCs – not mentioned in the text describing the sources of income excluded – were included. Language conflicted as to whether a couple of deductions were eliminated or retained. Reference was made to a non-existent paragraph (section 38(c) referred to paragraph (xxi)). It created a serious problem with the rule for basis determination/adjustment.[10] Some of these questions were resolved administratively before the beginning of 2013 (such as the inclusion of LLCs).[11] Others were resolved in the next legislative session, during 2013, but made applicable to all of 2013 (such as the basis determination issue).

In addition to addressing technical issues, 2013 tax legislation returned (or partially returned) some eliminated or reduced credits and refunds, and scaled back some of the scheduled future changes, while accelerating and adding others. More changes were enacted in 2014 and 2015. In 2013 a scheduled decrease in the sales tax rate was scaled back, and in 2015 the sales tax rate was increased from 6.15 to 6.5 percent. The factors at play behind these changes likely included political pressures, revenue problems, and a polarizing agenda in place before the 2012 legislation was enacted.[12]

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[10] For additional details regarding uncertainties surrounding the initial text, see Dickinson, Mazza, and Keenan (2012), which provides an in-depth description and analysis of the bill as enacted, as well as some of the immediately following administrative interpretations.

[11] The Kansas Department of Revenue issued a formal revenue ruling August 30, 2012, providing guidance on how it would administer the bill (KDR Revenue Ruling 19-2012-02). It also maintained a set of FAQs about the legislation, and issued multiple Revenue Notices.

[12] See, for example, Governors State of the State Address from January 2011 noting a tax policy agenda.

3.3. Corporate Income Tax

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 use the synthetic control method (SCM) to estimate impacts of the tax reform on output, employment, and establishments in Kansas. The SCM was pioneered in Abadie and Gardeazabal (2003), and expanded on by Abadie, Diamond and Hainmueller (2010, 2015). It has been applied in the context of evaluating tax policy impacts.[13] The SCM is particularly well suited for exam-

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[13] For example, Adhikari and Alm (2016), use the SCM to evaluate the impact of flat tax reforms.

ining impacts of a single policy intervention on aggregate outcome variables. Policy evaluation frameworks require identifying a credible source of comparison to serve as a counterfactual. Selecting a single state or group of states can be difficult and arbitrary. The SCM potentially yields a more credible comparison. 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, the weights assigned to each state in the donor pool are optimized so that the resulting synthetic control matches the treated state as closely as possible during a pre-intervention period.

The framework is as follows. States $j = 1, \ldots, J+1$, are observed for time periods $t = 1, \ldots, T$. The first state $(j = 1)$ is Kansas (or more generally the treated state). The J 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_{jt} denotes the outcome of interest for state j at time t. The effect of the policy intervention for unit j at time t is specified as $\alpha_{jt} = Y_{jt}^T - Y_{jt}^0$, where Y_{jt}^0 denotes the outcome that would be observed without the intervention. Outcomes are modeled in a potential outcomes framework following a linear factor model, as follows:

$$
\begin{aligned}
Y_{jt} &= Y_{jt}^0 + \alpha_{jt} D_{jt} \\
Y_{jt}^0 &= \delta_t + \boldsymbol{\theta}_t \mathbf{Z}_j + \boldsymbol{\lambda}_t \boldsymbol{\mu}_j + \varepsilon_{jt}
\end{aligned}
$$

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where

$$
D_{jt} \;=\; \begin{cases} 1 & \text{if } i = 1 \text{ and } t > T_0 \\[2ex] 0 & \text{otherwise.} \end{cases}
$$

and δ_t are common time effects, Z_j is a vector of observed covariates unaffected by the intervention, μ_j are permanent unobserved variables, $\boldsymbol{\theta}_t$ and $\boldsymbol{\mu}_j$ are parameter vectors, and ε_{jt} are unobserved, mean zero, unit level transitory shocks. When $\boldsymbol{\lambda}_t = 1$, this simplifies to a two-way fixed effects model.

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

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

where $\mathbf{X_1}$ is a vector of predictor variables for the treated unit, $\mathbf{X_0}$ is a matrix containing the same predictor variables for each of the donor pool units, and $\mathbf{V}$ 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.[14] I solve for both the donor pool and predictor variable weights using the Synth package in R.

Given $\mathbf{W}^*$, and a matrix $\mathbf{Y_0}$ containing the outcome variable values for

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[14] 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 chose the predictor variable weights.

each donor pool unit in each time period, the counterfactual outcome path is $\mathbf{Y_1^*} = \mathbf{Y_0}\mathbf{W^*}$. The difference between that counterfactual outcome path and the observed values for the treated unit following the policy intervention gives the estimated policy impact. Dynamic treatment effects for year $t \in \{T_0 + 1, \cdots, T\}$ are given by:

$$\hat{\alpha}_{1t} = Y_{1t} - \sum_{j=2}^{J+1} w_j^* Y_{jt}$$

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

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

Following Abadie, Diamond and Hainmueller (2015), the root mean square prediction error (RMSPE) is used to measure goodness-of-fit over the pre-intervention period.[15]

Unlike difference-in-difference estimates, synthetic control estimates allow for time varying heterogeneity in unobserved variables. Abadie, Diamond and Hainmueller (2010) show this in the context of a linear factor model. The major assumption is that the outcome variable follows a linear factor model in the treated state, and that states in the donor pool follow the same factor

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[15] The formula used is:

$$RMSPE = \sqrt{\frac{1}{T_0} \sum_{t=1}^{T_0} \left(Y_{1t} - \sum_{j=2}^{J+1} w_j^* Y_{jt} \right)^2}$$

model. Then 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 are that untreated states in the donor pool are not affected by the intervention of interest (no spillover effects), and that the intervention has no effect on the outcome before being implemented (no anticipation effects).

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 formed for each of those states, 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.[16] 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.

Not all states will be well matched by synthetic controls. For example, values from a state with extreme values relative to the donor pool values cannot be reproduced using a convex combination of values from the donor pool. 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 of the chance of estimating an effect as large

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[16] The formula used is:

$$p_1 = \frac{\sum_{j=2}^{J+1}\{\hat{\alpha}_j \geq \hat{\alpha}_1\}}{J}$$

as that estimated for a state with a closer pre-intervention fit. To adjust for this, thresholds are used to eliminate states without a close enough fit in the pre-intervention period. 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.

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. 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. The placebo method does not reflect this source of uncertainty.

Difference-in-Differences Estimates

I also estimate the difference-in-differences using the following standard model:

$$Y_{it} = \alpha \left(KS_i \times Post_t \right) + X_{it}\beta + u_i + v_t + \epsilon_{it},$$

where Y_{it} is the outcome variable, u_i 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_i is an indicator equal to one for Kansas. $Post_t$ is an indicator equal to one for observations in 2013 or later. X_{it} is a vector of time

varying controls. α is the coefficient of interest. The identifying assumption is that the treated and control states follow parallel trends in the outcome variable given the control variables. As with the SCM, this approach requires no spillover effects and no anticipation effects.

5. Data

This section briefly introduces data and samples used. Further detail regarding the data can be found in Appendix B.

5.1. Outcome Measures

Primary measures of employment and establishments are from state-level County Business Patterns (CBP) data produced by the U.S. Census Bureau. The data largely does not include public employment.[17] Unfortunately, CBP omits much of the agricultural sector – an import part of the Kansas economy. As a robustness check, I use another employment measure from the BEA, State Personal Income accounts. The second measure includes both wage and salary employment and proprietor employment. Because the policy changes created an incentive to recharacterize income (from wage and salary income, still subject to the state income tax, to another form, not subject to the state income tax), it is important to look at both. A separate measure of establishments, restricted to establishments with no employees is also considered. This measure is of nonemployer establishments from the U.S. Census Nonemployer Statistics (NES) data. Nonemployers are not counted in either establishments

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[17] If substantial revenue declines decrease state government employment, it would offset gains in private employment. While relevant from many perspectives, proponents of the 2012 tax changes have argued that the goal was private job creation.

or employment. The NES nonemployer counts should capture increased self-employment, and potentially some, but likely not all, types of status changing responses.

Real gross state product (RGSP) is from BEA's Annual Gross Domestic Product (GDP) by State data. Breakdowns by both state and industry are used in analysis. Aggregate state-level GSP includes public sector production. In Kansas, this accounted for approximately 15.1 percent of annual RGSP on average from 2000 to 2011. A concern is that declining expenditures accompanying declining revenues will have an offsetting effect on RGSP. This would confound positive tax reform impacts with expenditure impacts. To address this concern, I construct an adjusted measure of RGSP by subtracting out the public sector, and report results for both the original and adjusted measures.

All outcome variables are broken down by industry and aggregated into twelve supersectors based on the QCEW High-Level Industry Crosswalk (BLS). Industry shares in some case vary substantially. In using industry shares as a predictor in the synthetic control analysis, the RGSP shares are used with all outcome variables because they are expected to be less sensitive than the others to the policy change.

5.2. Other Measures

Predictors used in constructing synthetic controls include RGSP sector shares, population estimates with demographic breakdowns, labor market indicators, and human capital, measured by education level.[18] These capture important factors based on standard economic growth models. They also

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[18] Similar variables are used by Abadie and Gardeazabal (2003) and Abadie, Diamond, and Hainmueller (2015) in looking at economic growth.

capture likely determinants of labor supply and labor demand. Population estimates and related breakdowns are from the U.S. Census Bureau. Labor market and education measures 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 in all SCM analysis. The specific predictors for each outcome and resulting weights are reported with results.

Other analysis in this paper uses state-level tax collection data from the U.S. Census Bureau. Quarterly values are added to get calendar year values. 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.[19] State-level migration data is from the IRS. Per capita personal consumption expenditures data is from the BEA.

5.3. Samples

The synthetic control analysis uses state-level data with a donor pool selected from the 50 U.S. 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 set threshold. Louisiana is excluded.

Policy thresholds have been used in other contexts to decide which groups

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[19] 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. Some states appear to have inconsistently recorded data (in some cases this is explained in the footnotes, and appears to be a result of a particular state having a difficult to compare tax system). However, it is a valuable source, particularly in light of the absence of obvious alternatives (short of separately checking each state for each year). Unless otherwise indicated, states with apparent inconsistently coded rates are not included in analysis. At least some of these states have tax system features making them more difficult to compare (this in turn likely drives the inconsistency). Aside from excluding those states, and correcting the omitted Kansas rate change, the data is taken largely at face value.

to include in a donor pool.[20] I use one percentage point as a threshold. Specifically, the top marginal individual and corporate income rates are used. One percentage point in a single year is a substantial change. Often smaller, incremental changes are implemented over a number of years. 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.

Only 12 out of 77 recorded top individual income tax rate cuts were of one percentage point or greater in a single year. Similarly, only 15 out of 60 recorded top corporate income tax rate cuts were of that magnitude. The top rate increases observed were more likely to be that large, but fewer increases are observed overall. Eleven out of 28 recorded increases in the top individual rates were one percentage point or larger. Twelve out of 20 recorded increases in the top corporate rates were that large.

The baseline donor pool excludes states based on both the corporate and individual income rates, and for both increases and decreases satisfying the threshold.

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.

The pre-intervention period used for optimizing synthetic control weights is 2001 to 2011. As explained above, 2012 is not included in the pre-intervention

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[20] 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.

period due to concern about anticipation effects.[21] Following Abadie, Diamond and Hainmueller (2010) and others, I use ten years of pre-intervention data. While this might seem long, longer time periods should reduce the chance of potential bias due time varying unobservable effects (the bias approaches zero as the pre-intervention period length gets large). Graphical results allow assessment of how well the estimated synthetic control tracks the observed data over this time period.

Robustness checks, described in the results section, test for sensitivity to variation in donor pool membership and pre-intervention period.

The difference-in-differences analysis uses a slightly modified version of a control group based on geographic proximity. The four states bordering Kansas are Colorado, Missouri, Nebraska, and Oklahoma. I use Iowa, Missouri, Nebraska, and Oklahoma, in essence replacing Colorado with Iowa. 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, started taking effect in Colorado at the end of 2013. Admittedly, this makes the control group selection more ad-hoc than it would be relying solely on geographic proximity and selecting the bordering states.

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[21] The reform was fully enacted by the middle of 2012, leaving substantial time for taxpayers to plan for and potentially change activity in anticipation of those changes taking effect at the beginning of 2013. As a result, 2012 is not included in the pre-intervention period.

6. Synthetic Control Results

Baseline synthetic controls are estimated for RGSP per capita, employment, nonemployers, and establishments. Results are presented in a series of graphs and tables. Table 1 shows the weights assigned to donor pool states for each outcome.[22] Selection of donor units is sensitive to both predictor and donor pool composition. Figures 3 through 6 display graphical results by outcome. Each numbered figure includes four graphs: (a) the observed Kansas outcome and estimated synthetic Kansas counterfactual outcome, (b) the gap between actual Kansas and synthetic Kansas, (c) placebo analysis results, and (d) the post to pre intervention RMSPE ratio distribution for Kansas and each state in the donor pool. Table 2 reports baseline estimated treatment effects and RMSPE for each outcome.

After presenting baseline results, I repeat the analysis with slightly modified versions of my primary outcome measures. For RGSP per capita, I subtract off the public sector, which in this context could mask private sector gains. For employment, I consider an additional employment measure, which has more inclusive agricultural sector coverage, and which can be decomposed into proprietor employment and into wage & salary employment. Agriculture is an important part of the Kansas economy, and, as discussed above, the policy changes incentivized recharterizing employee status. Thus both are potentially important in this context.

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[22] The composition of states with strictly positive weights varies for each outcome. Not surprisingly, Nebraska and Oklahoma, two of the four border states, always receive positive weights. More surprisingly, Maine does too. Iowa and Massachusetts receive positive weights for three of four outcomes. West Virginia receives a positive weight for two outcomes. Colorado and Idaho each receive a positive weight for one outcome. Perhaps most surprisingly, Missouri, one of the four border states, does not receive positive weights for any outcome.

The results for the first outcome, RGSP per capita, are fleshed out in greater detail than the others. Similar explanations hold for other outcomes.

6.1. Gross State Product

Baseline synthetic control estimates suggest a negative impact on RGSP per capita. The average treatment effect, reported in Table 2, is approximately negative 2,999 per capita. This is economically quite substantial - a loss of almost $3,000 per person, per year. The dynamic treatment effect in 2013, is approximately negative 2,337. The magnitude increases in both 2014 and 2015. However, as reported in Table 2, the number is not statistically significant applying the ratio test of Abadie, Diamond, and Hainmueller (2015).

Figure 3 presents results in four graphs. In the first, Figure 3(a), the blue line shows actual RGSP per capita in Kansas. The gray line shows the estimated RGSP for synthetic Kansas. The red dashed vertical line marks the beginning of 2013, when the new tax policies took effect. After the policy change takes effect, the difference between the actual data and the synthetic control is the estimated policy effect. The closer the synthetic control tracks the actual data before the policy change, the better the fit, and the more convincing the results. The size of the gap between the actual data and the synthetic control is shown in Figure 3(b).

The pre-intervention period RMSPE is 603.5988. The pre-intervention fit is decent overall but some segments are concerning. As can be seen in Figures 3(a) and (b) the fit loosens from 2004 to 2008. The magnitude of the gap ranges from around negative 955 in 2005 to 1,131 in 2008. Figure XX shows that this segment of RGSP per capita is also not well matched by

22

other potential control groups considered.[23] A prominent gap also appears before 2001, which was not used in optimizing weights, and is not reflected in the RMSPE. This raises a potential concern about the out-of-sample fit. If an estimated synthetic control does not fit the period immediately prior to the optimized range well, it raises a question about how well it fits the period immediately following (i.e., the post-intervention period). The peak magnitude of the gap observed prior to 2001, is in 1999 at which point it reaches approximately 1,858. However, all of these observed gaps prior to the policy change are smaller than those observed in each of the years following the policy change (around negative 2,337 in 2013 and larger in magnitude each year thereafter). Computing an average treatment effect using the pre-intervention gaps from 2001 to 2011 yields negative 1.63, much smaller than the post-intervention average treatment effect of negative 2,999. This indicates there may have been some change, but that perhaps it is not precisely estimated. Another concern is that the gap appears to begin increasing before the policy intervention.

Figure 3(c) shows the placebo analysis results. Grays lines show the estimated gap for each state in the donor pool. The blue line shows the gap for Kansas. After the policy change, Kansas lies below all but one other state. Figure 3(d) plots the post to pre intervention ratio for Kansas and all states in the donor pool with no restrictions. Only two states have values above Kansas. However, given the small number of states included, the implied empirical p-value is not significant based on traditional thresholds.[24]

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[23] Specifically, RGSP per capita declines somewhat after 2004 while the averages continue to increase. It then climbs more steeply than the averages until 2009.

[24] Kansas is 3rd out of 15 along the distribution. The reported p-value is $3/15 = 0.2$.

Table 1 reports the weights assigned to each state in the donor pool. In order of importance states with strictly positive values are: Oklahoma (69.9), Maine (19.7), and Nebraska (10.4). The assigned predictor weights, in order of importance, are: construction sector share (20.9), financial activities sector share (17.7), 2008 RGSP per capita (12.1), population growth (9.6), 2007 RGSP per capita (9.4), prime age male (8.6), bachelor or higher education (6.6), middle skill workforce (3.0), 2003 RGSP per capita (3.0), 2001 RGSP per capita (2.9), 2002 RGSP per capita (2.4), 2006 RGSP per capita (1.3), sales tax rate (1.2), labor force participation rate (1.2), and manufacturing sector share (0.1). The following variables were assigned zero weight: natural resources and mining sector share, trade, transportation, and utilities sector share, information sector share, professional and business services sector share, high school or lower education, unemployment rate, and population density.

6.2. Employment

The synthetic control estimated for statewide employment also suggests that, if anything, the reform had negative impacts. Figure 4 depicts graphical results. Figure 4(a) compares observed employment with employment predicted by the synthetic control. Synthetic values are greater than actual values for all years following the reform, but as with RGSP per capita, the gap between trends begins before the reform takes effect. The gap becomes substantially larger in 2015, reaching negative 40,257 (from negative 24,086 in 2014). The average treatment effect, reported in Table 2, is negative 29,956. This would represent approximately 2.65 percent of average annual employment in Kansas from 2000 to 2011. Again, this would be economically substantial – almost 30,000 fewer jobs in each year. However, as with RGSP per capita, the result is not significant applying the RMSPE ratio test and these numbers

cannot rule out alternative causes of the gap. It is also hard to imagine a substantial tax cut resulting in a decrease in employment of that magnitude.

The estimated synthetic Kansas fits well until the gap starting just before the reform. The pre-period RMSPE is 8,317.269. States receiving positive weights, in order of importance, are Iowa (31.1), Nebraska (27.2), Massachusetts (21.6), Colorado (16.6), Maine (2.7), Oklahoma (0.4), and West Virginia (0.3).[25]

6.3. Nonemployers

Synthetic control estimates suggest that there was a positive impact on nonemployer establishments. Figure 5 shows graphical results. As shown in Table 2, the average treatment effect is approximately 2,697. In 2013, the effect is approximately 4,076, for 2014, it is approximately 2,623, and for 2015, it is approximately 1,391. The pre-intervention RMSPE is 592.48. Statewide, the average treatment effect is modest, representing approximately 1.532 percent of the annual average from 2001 to 2011 (slightly less than the average annual growth rate of 1.544 percent during that period). The 2015 effect is more substantial.

States receiving positive weights, in order of importance, are Nebraska (44.9), Massachusetts (21.1), Iowa (15.1), Maine (14.6), West Virginia (3.4),

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[25] The assigned predictor weights, in order of importance, are: professional and business services share (17.8), employee compensation per capita (17), 2011 employment (9.6), 2005 employment (8.6), 2001 employment (8.5), 2009 employment (7.5), 2008 employment (6.9), middle skill workforce (6.8), bachelor or higher education (5.1), population density (4.3), labor force participation rate (3.5), natural resources and mining share (2.7), construction share (0.7), population growth rate (0.7), leisure and hospitality share (0.3), and high school or lower education (0.1). Prime age male was assigned zero weight.

Oklahoma (0.6), and Idaho (0.2).[26]

6.4. Establishments

Baseline synthetic control results for the number of establishments do not show an increase in the number of business establishment operating in Kansas following the tax reform. Graphical results are presented in Figure 6. The average treatment effect is negative 821.29. Dynamic treatment effects start in 2013 at negative 778.81, decrease slightly in 2014 to negative 744.92, then increase to negative 940.148 in 2015. As with RGSP per capita and employment, the gap between actual and synthetic predicted values begins in the years before the tax policy changes took effect. However, the pre-period gaps are smaller than those after: in 2010 there is a gap of negative 69.626, in 2011 there is a gap of negative 187.528, and in 2012 there is a gap of negative 419.44. In the context of the entire state, the size of these estimated impacts are modest. The average treatment effect represents approximately 1.0898 percent of the 2001 to 2011 annual average. The 2015 effect, which is the largest, represents approximately 1.2476 percent of that average.

States receiving positive weights, in order of importance, are: Iowa (37.1), Massachusetts (36.6), Maine (13.8), Nebraska (8.1), and Idaho (4.4).[27]

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[26] The assigned predictor weights, in order of importance, are: 2009 nonemployers (26.5), 2001 nonemployers (19.3), 2005 nonemployers (12.6), middle skill workforce (11.6), natural resource and mining share (7.4), 2008 nonemployers (5.8), labor force participation rate (5.7), employee compensation per capita (3.2), prime age male (2.5), population density (2.4), professional and business services share (1.9), bachelor or higher education (0.6), construction sector share (0.4), and leisure and hospitality sector share (0.2), high school or lower education, and population growth rates were assigned zero weights.

[27] The assigned predictor weights, in order of importance, are: professional and business services sector share (22.7), 2001 establishments (22.1), employee compensation per capita (18), middle skill workforce (14.7), 2008 establishments (10.2), prime age male (9.3), population density (1.2), labor force participation rate (1.0),

7. Focusing on Private Sector RGSP

Subtracting the public sector component out of RGSP makes little difference. Graphical results are shown in Figure 9. Table 3 compares the original RGSP results with those obtained excluding the public sector. Treatment effects are all still negative and of similar magnitude, but slightly less negative. For the combined public and private sector, the ATE is negative 2,999. For the private sector alone, the ATE is negative 2,813.

Weights assigned to control states are similar. In order, they are: Oklahoma (61.1), Nebraska (18.6), Maine (18.0), and Mississippi (2.3).[28]

8. Alternative Employment Measures

Results using the broader BEA measure of employment are consistent with other results. Graphical results are presented in Figure 10 for total employment, and for two subcomponents: proprietor employment, and wage and salary employment. Table 4 reports corresponding numbers. The average treatment effect for total employment is negative and of larger magnitude

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2009 establishments (0.5), and construction sector share (0.01). The following variables were assigned zero weight by the optimization procedure: population growth rate, natural resources and mining sector share, leisure and hospitality sector share, high school or lower education, and 2005 establishments.

[28] The assigned predictor weights, in order of importance, are: financial activities sector share (15.5), construction sector share (12.6), population growth rate (10.0), bachelor or higher education (9.99), prime age male (8.3), middle skill workforce (7.2), professional and business services sector share (6.7), 2007 private sector RGSP per capita (6.7), unemployment rate (5.1), 2008 private sector RGSP per capita (3.9), population density (3.1), 2002 private sector RGSP per capita (2.6), 2006 private sector RGSP per capita (2.2), information sector share (2.0), labor force participation rate (1.0), 2003 private sector RGSP per capita (1.0), manufacturing sector share (0.8), trade, transportation, and utilities sector share (0.4), high school or lower education (0.3), and 2001 private sector RGSP per capita (0.3). The natural resources and mining was assigned zero weight.

than for the CBP employment measure: negative 35,683 compared to negative 29,956. Looking at the dynamic effects, in 2013 and 2014 the BEA measure effects were of smaller magnitude than the CBP measure effects. The estimated BEA measure impact becomes much larger in 2015, surpassing the CBP impact.

The dynamic effects for the two component breakdown of total employment in the first two years indicate that decreases in wage and salary employment were potentially being offset by increases in proprietor employment. For example, in 2013, the wage & salary treatment effect is negative 28,648, the total employment treatment effect is negative 35,683, and the proprietor employment treatment effect is 8,471.

9. Migration

Part of the anticipated positive impact was expected to result from migration. A favorable tax climate attracting individuals to move to the state, should increase economic activity. A smaller than expected migration impact could in turn help explain smaller than expected results from the policy. Table 6 shows state-level migration data for Kansas covering 2012 to 2015 based on tax return data from the IRS. Numbers reflect the number of tax returns, which roughly correspond to the concept of a household. The 2011 to 2012 numbers indicate the number of returns filed with an address in the origin state in 2011, and then with an address in the destination state in 2012. The left columns show the number of filers with Kansas addresses in the first year who moved out of the state in the second year. The right columns show the number with an address outside of Kansas in the first year who moved to a Kansas address in the second year. For each set of years, total outbound and

inbound numbers are reported as well as breakdowns, showing the numbers moving into and out of Missouri, Oklahoma, Colorado, Nebraska, and Iowa.

In all years from 2012 to 2015, Kansas had total outbound migration greater than total inbound migration. Looking at the breakdowns by state, it looks like there may potentially have been some impact at the Kansas-Missouri border, with more households moving into Kansas than leaving in between 2013 and 2014 (yielding a net increase of seven households on the Kansas side of the border). In all other years shown, net Kansas-Missouri migration is negative. Net migration from Colorado and Oklahoma is negative in all years shown. Net migration from Nebraska and Iowa is positive in some years, negative in others.

10. Consumption

The sharp decline in revenue should have a corresponding increase in some other category or categories. To investigate this, I calculate difference-in-differences estimates for several categories of personal consumption expenditures. Using a pre-intervention period going back to 2001, there is a statistically significant negative impact on recreation services spending. This is the case using both the modified control group, and the border state control group. However, when a shorter pre-intervention period, beginning in 2010, is used, the result is no longer significant. For all other personal consumption expenditure categories, difference-in-differences estimates are not statistically significant.

11. Conclusions

The 2012 Kansas tax reform does not appear to have operated like a shot of adrenaline to the heart of the economy. Rather, relative to the readily apparent impact on state tax revenue, there were no discernible impacts state-level aggregate economic outcomes. Synthetic control estimates indicate that, if anything, there may have been negative impacts on state RGDP and employment.

Estimates for wage and salary employment and for proprietor employment are consistent with individuals moving from one category to the other. This could reflect both distortionary behavior, wherein individuals recharacterize their income to take advantage of favorable tax treatment, and a shift toward business creation and self-employment.

Similarly, the nonemployer establishment estimates suggest a small positive impact on business creation among businesses without any employees. This could help explain the lack of impact on employment. Individuals exiting employment to start businesses could have offset new job creation, although in that case you might expect to see exiting employees being replaced.

Initial ambiguities and subsequent changes could help explain delayed or limited responses in economic activity. Although, many such concerns were resolved before 2013 began. As could signals sent when the legislature demonstrated its willingness to impose retroactive changes. The lack of clear plan for balancing the budget in the future assured that future revenue or spending changes would be required. This in turn could have made individuals hesitant to change activity based on the tax changes. The sales tax changes also may have limited the 2012 reform's effectiveness. The initial sales rate change in 2013 was a decrease relative to where the rate was at that point, but kept the

rate at an elevated level relative to what it was prior to what it was increased to in 2010 as a temporary revenue increasing measure (the increase originally scheduled to start phasing out in 2013).

Figure 1: Individual Income Tax Revenue, Annual State Average (millions/year)
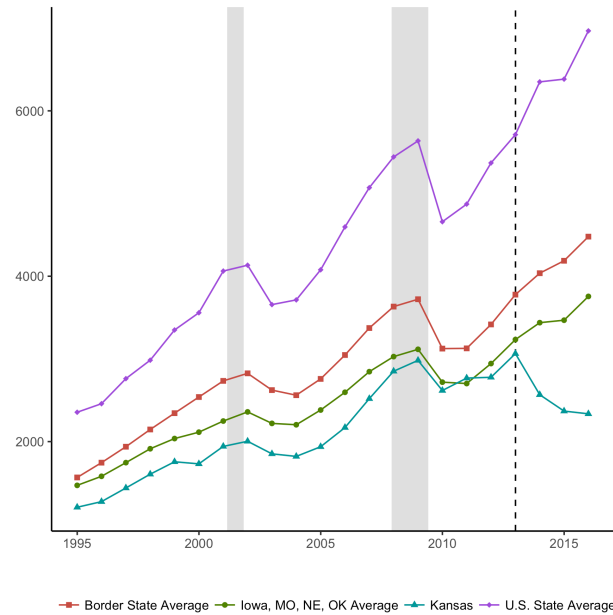
Source: U.S. Census Bureau and author calculation. Numbers are nominal and not seasonally adjusted. Shaded areas reflect NBER recession dates. Dashed vertical line marks the beginning of 2013 (policy effective date).

Figure 2: Total State Tax Revenue, Annual State Average (millions/year)
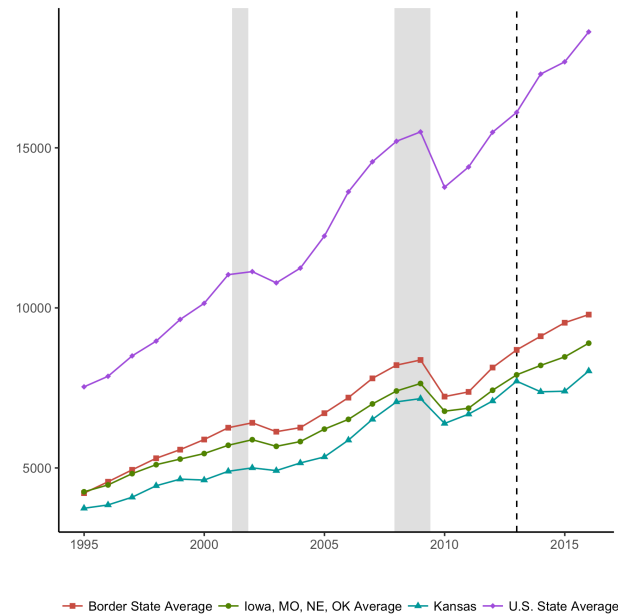
Source: U.S. Census Bureau and author calculation. Numbers are nominal and not seasonally adjusted. Shaded areas reflect NBER recession dates. Dashed vertical line marks the beginning of 2013 (policy effective date).

Table 1: Baseline Synthetic Control Weights

State	RGSP	Emp	NES	Est
Arkansas	0	0	0	0
Colorado	0	.166	0	0
Georgia	0	0	0	0
Idaho	0	0	.002	0
Iowa	0	.311	.151	.371
Massachusetts	0	.216	.211	.366
Maine	.197	.027	.146	.138
Mississippi	0	0	0	0
Missouri	0	0	0	0
Nebraska	.104	.272	.449	.081
Oklahoma	.699	.004	.006	.044
Pennsylvania	0	0	0	0
South Carolina	0	0	0	0
West Virgina	0	.003	.034	0

Weights estimated using the R package Synth (Hainmueller and Diamond 2014). See text for additional details and corresponding results.

Figure 3: Real Gross State Product Per Capita
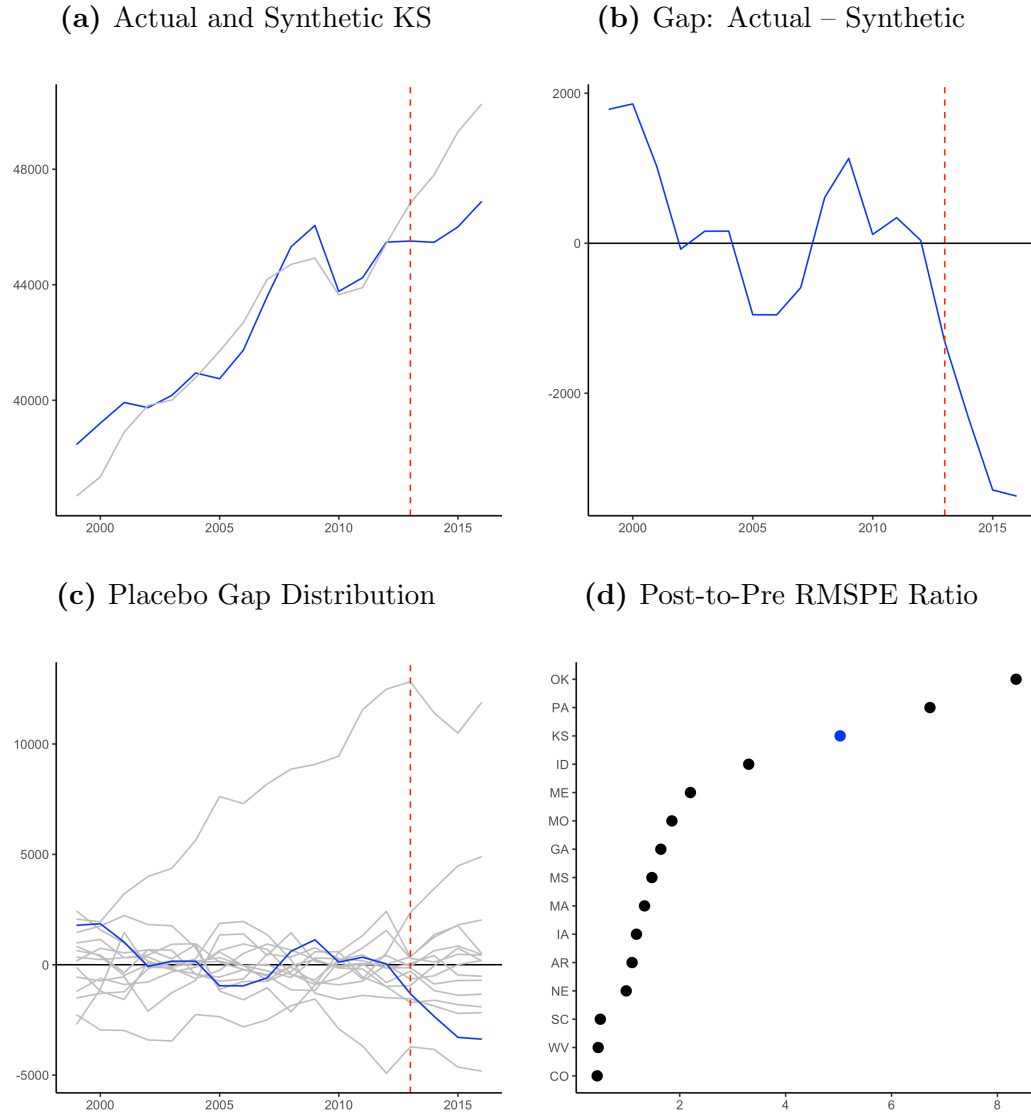
(a) Actual and Synthetic KS

(b) Gap: Actual – Synthetic

(c) Placebo Gap Distribution

(d) Post-to-Pre RMSPE Ratio

Dashed red vertical line marks the beginning of 2013 (policy effective date).

(a) Blue represents actual Kansas data. Gray represents estimated synthetic control.

(c) Blue represents the gap between actual and synthetic for Kansas. Gray lines show the 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. 2012 is not included in either.

Source: Annual Gross Domestic Product (GDP) by State, BEA.

Figure 4: Statewide Employment

(a) Actual and Synthetic KS

(b) Gap: Actual – Synthetic

(c) Placebo Gap Distribution

(d) Post-to-Pre RMSPE Ratio

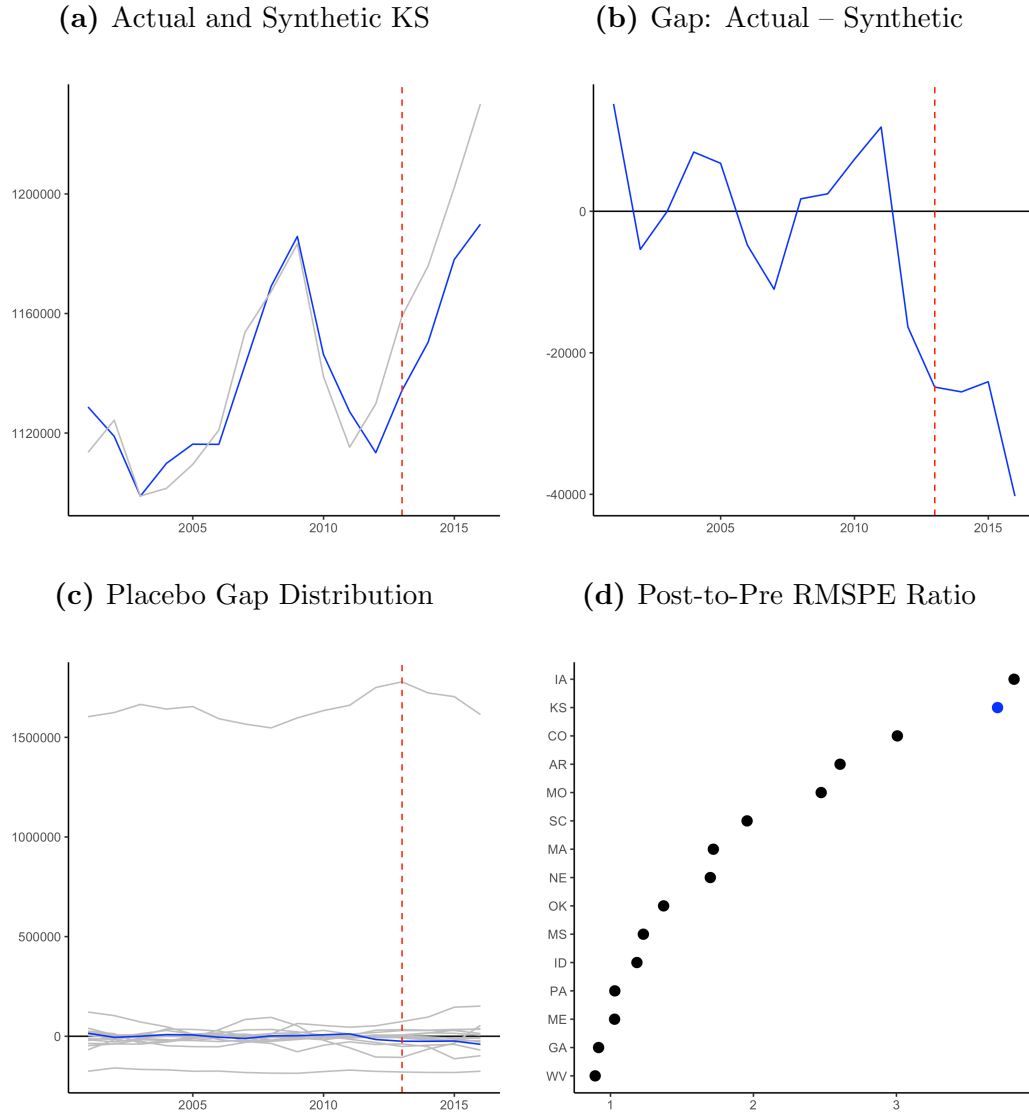Dashed red vertical line marks the beginning of 2013 (policy effective date).
(a) Blue represents actual Kansas data. Gray represents estimated synthetic control.
(c) Blue represents the gap between actual and synthetic for Kansas. Gray lines show the gap between observed data and an estimated placebo 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. 2012 is not included in either.
Sources: County Business Patterns, U.S. Census.

Figure 5: Statewide Nonemployer Establishments

(a) Actual and Synthetic KS

(b) Gap: Actual – Synthetic

(c) Placebo Gap Distribution

(d) Post-to-Pre RMSPE Ratio

Dashed red vertical line marks the beginning of 2013 (policy effective date).
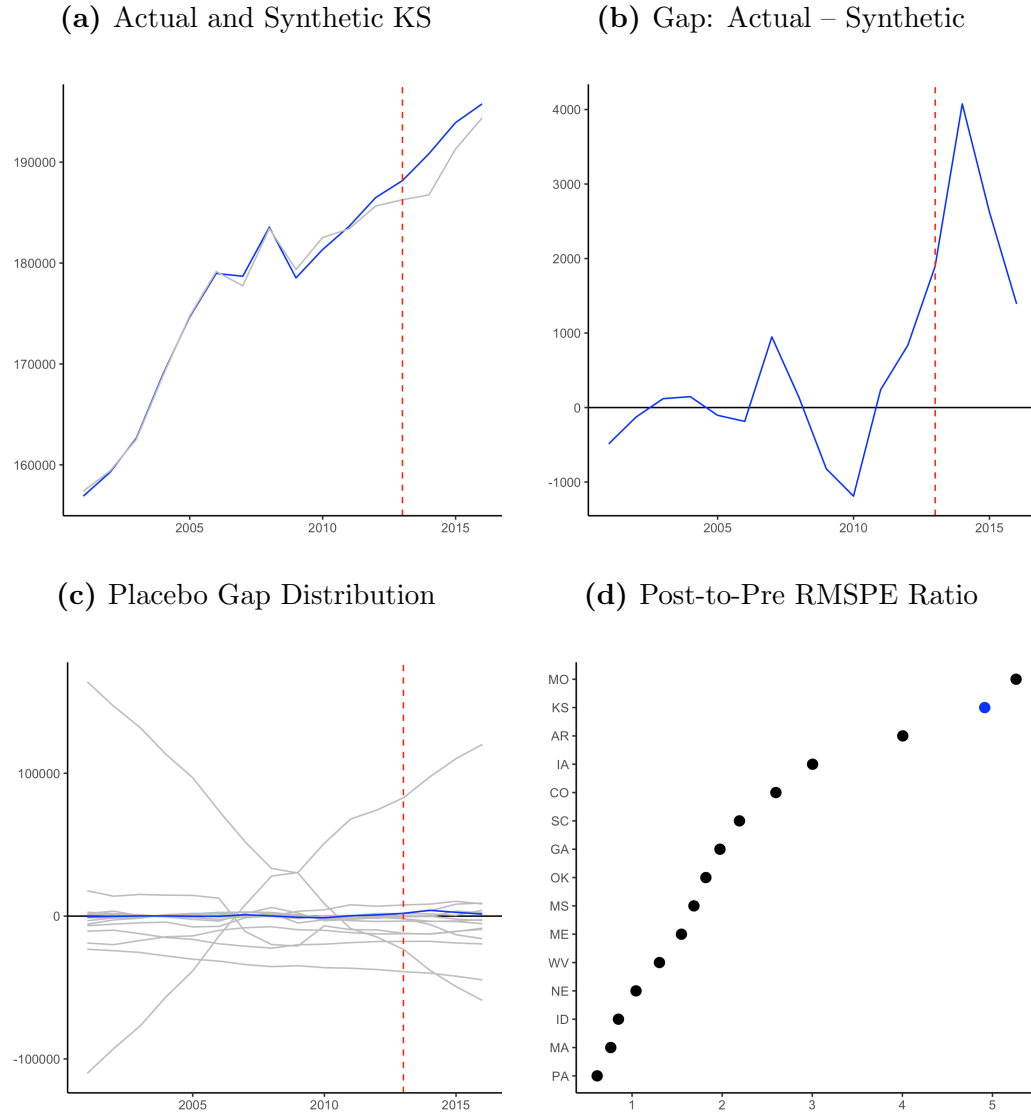(a) Blue represents actual Kansas data. Gray represents estimated synthetic control.
(c) Blue represents the gap between actual and synthetic for Kansas. Gray lines show the gap between observed data and an estimated placebo synthetic control for each state in the donor pool.
(d) Post-intervention RMSPE calculated for 2013 to 2015. Pre-intervention RMSPE is calculated for 2001 to 2011. 2012 is not included in either. Kansas is not included in the placebo donor pool.
Source: Nonemployer Statistics, U.S. Census.

Figure 6: Statewide Establishments

(a) Actual and Synthetic KS

(b) Gap: Actual – Synthetic

(c) Placebo Gap Distribution

(d) Post-to-Pre RMSPE Ratio

Dashed red vertical line marks the beginning of 2013 (policy effective date).
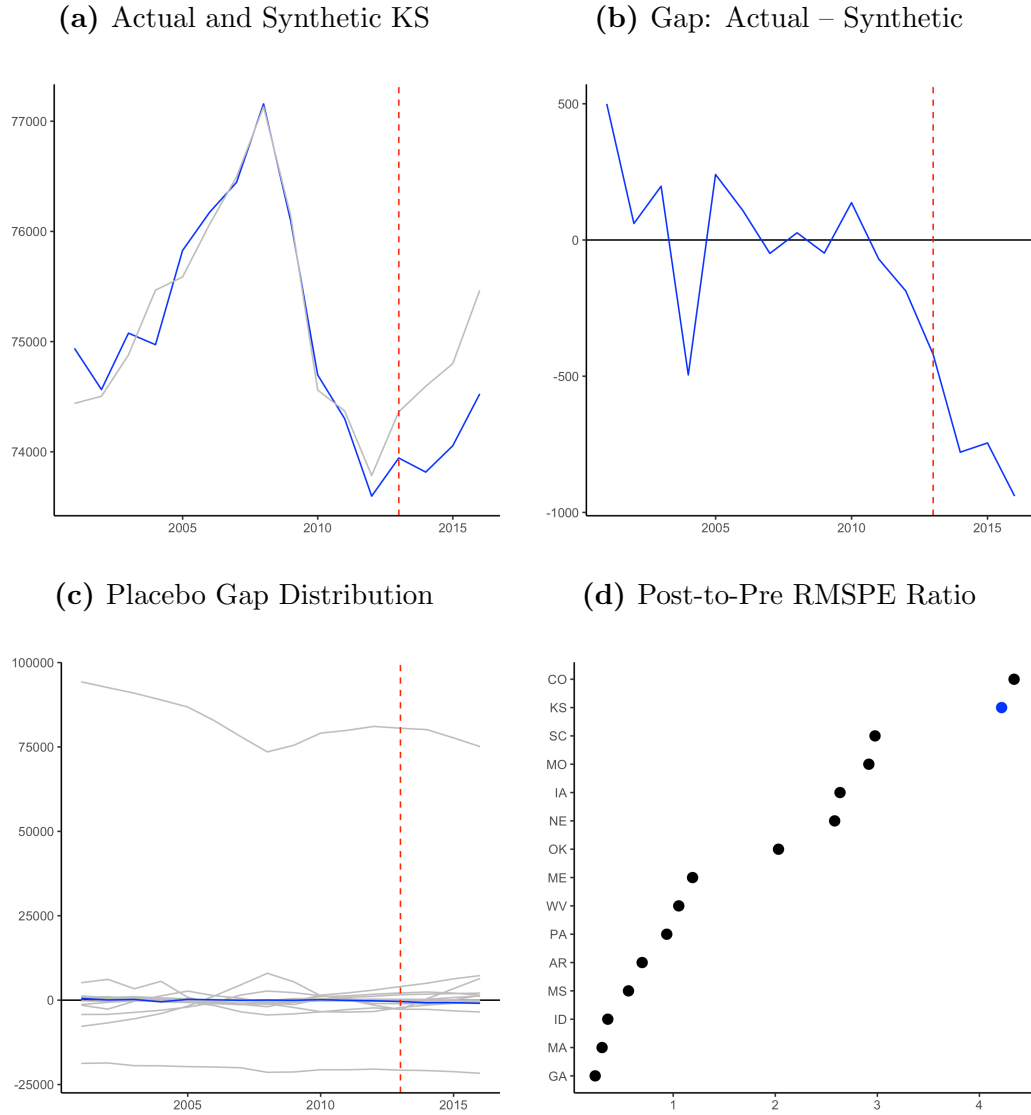
(a) Blue represents actual Kansas data. Gray represents estimated synthetic control.

(c) Blue represents the gap between actual and synthetic for Kansas. Gray lines show the 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. 2012 is not included in either. Estimates shown did not include Kansas in the placebo donor pool.

Source: County Business Patterns, U.S. Census.

Table 2: Baseline Synthetic Control Results

	RGSP	Emp	NES	Est
Average Treatment Effect	-2,999	-29,956	2,697	-821
Dynamic Treatment Effect				
2013	-2,337	-25,526	4,076	-779
2014	-3,289	-24,086	2,623	-745
2015	-3,372	-40,257	1,391	-940
RMSPE				
Pre	603.5988	8,317.27	592.48	195.79
Post	3,035.514	30,834.76	2,911.179	825.698
Ratio	5.029	3.707	4.914	4.217
Empirical RMSPE Ratio P-value	.2	.133	.133	.133

Synthetic control weights were obtained using the R package Synth. The pre-intervention period is 2001 to 2011. The post-intervention period is 2013 to 2015. RGSP is real gross state product per capita, calculated using annual gross domestic product by state from the BEA and state-level mid-year population estimates from the U.S. Census. Emp is annual mid-March statewide employment from U.S. Census, County Business Patterns. NES is annual statewide nonemployer establishments from U.S. Census, Nonemployer Statistics. Est is annual statewide establishments from U.S. Census, County Business Patterns. See appendix for additional measure details. Average treatment effect is computed for 2013 to 2015. Dynamic treatment effects are computed for the year indicated. Pre-RMSPE is computed for the pre-intervention period (2001 to 2011). Post-RMSPE is computed for the post-intervention period (2013 to 2015). See main text for formulas. P-value reported is based on the distribution of placebo RMSPE ratios for all states in the donor pool. Kansas was not included in the donor pool for computing reported placebo effects. (For employment and establishment measures, including Kansas decreases the value to .0625, the lowest possible value given the number of units).

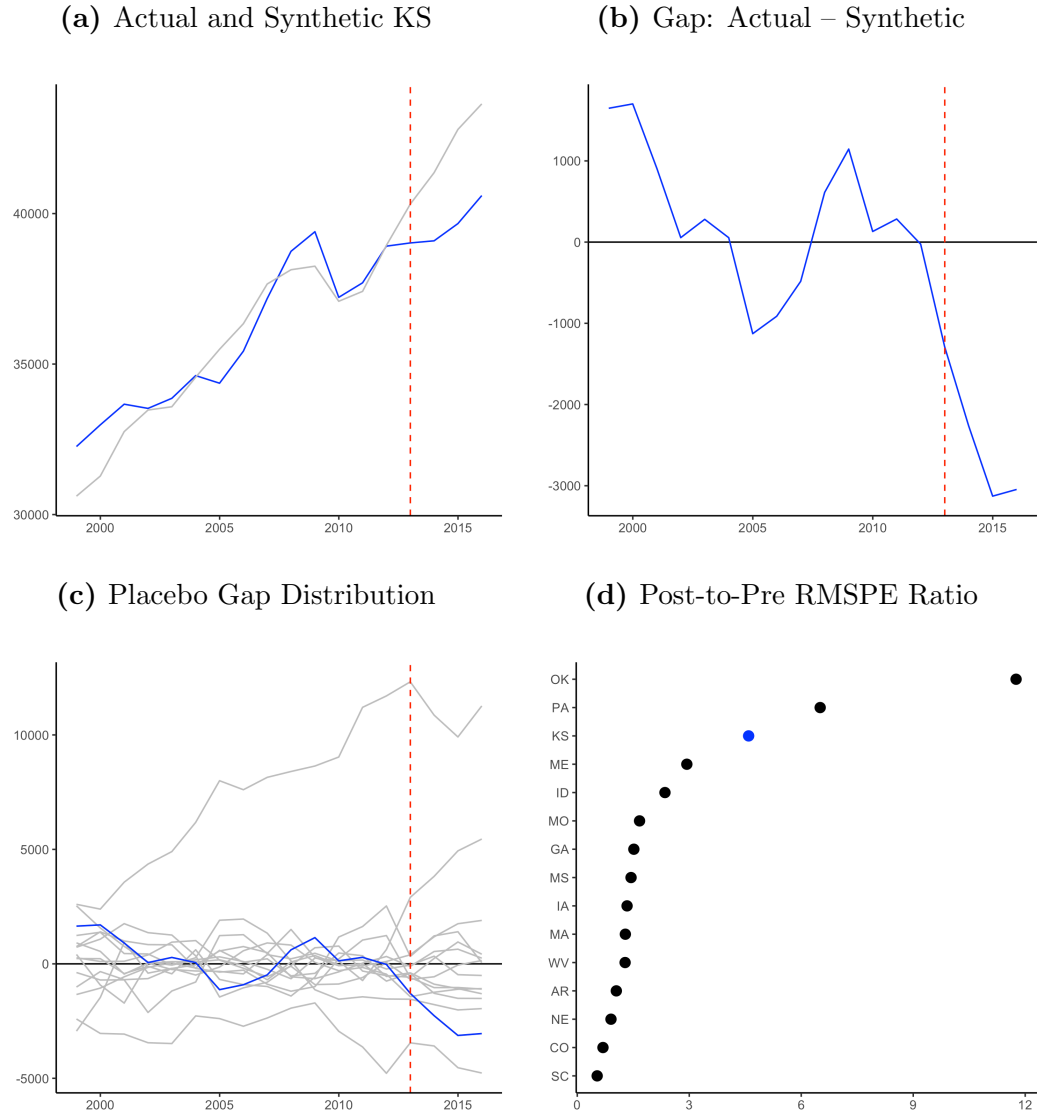**Figure 7:** Employment Measures, Kansas

CBP Emp — BEA Emp
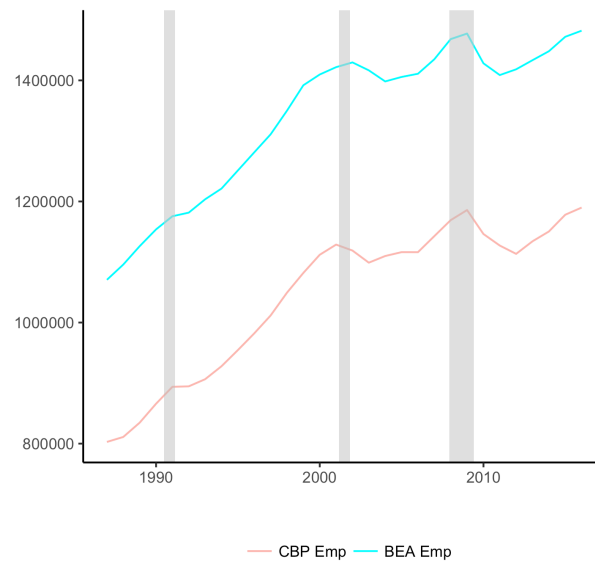
Source: U.S. Census Bureau and BEA. Shaded areas reflect NBER recession dates.

Figure 8: RGSP Per Capita Measures, Kansas

RGSP — RGSP - G

Source: BEA. Shaded areas reflect NBER recession dates.

Figure 9: RGSP Less Public Sector Per Capita

(a) Actual and Synthetic KS

(b) Gap: Actual – Synthetic

(c) Placebo Gap Distribution

(d) Post-to-Pre RMSPE Ratio

Dashed red vertical line marks the beginning of 2013 (policy effective date).

(a) Blue represents actual Kansas data. Gray represents estimated synthetic control.

(c) Blue represents the gap between actual and synthetic for Kansas. Gray lines show the 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. 2012 is not included in either.

Source: Annual Gross Domestic Product (GDP) by State, BEA.

Table 3: All and Private Sector 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	603.5988	618.544
Post	3,035.514	2,839.375
Ratio	5.03	4.59
Empirical RMSPE Ratio P-value	.2	.2

Synthetic control weights were obtained using the R package Synth. The pre-intervention period is 2001 to 2011. The post-intervention period is 2013 to 2015. RGSP is real gross state product per capita, calculated using annual gross domestic product by state from the BEA and state-level mid-year population estimates from the U.S. Census. RGSP results are the same reported in the baseline result table. They are provided again here for comparison. Priv RGSP is private sector RGSP, measured by subtracting the value of public sector RGSP from the total, using the amount reported for the public administration sector, NAICS code 92. It is also reported in per capita values. See appendix for additional measure details. Average treatment effect is computed for 2013 to 2015. Dynamic treatment effects are computed for the year indicated. Pre-RMSPE is computed for the pre-intervention period (2001 to 2011). Post-RMSPE is computed for the post-intervention period (2013 to 2015). See main text for formulas. P-value reported is based on the distribution of placebo RMSPE ratios for all states in the donor pool. Kansas was not included in the donor pool for computing reported placebo effects.

Figure 10: Total Employment, Proprietor Employment, Wage & Salary Employment

(a) Total   **(b)** Proprietor   **(c)** Wage & Salary
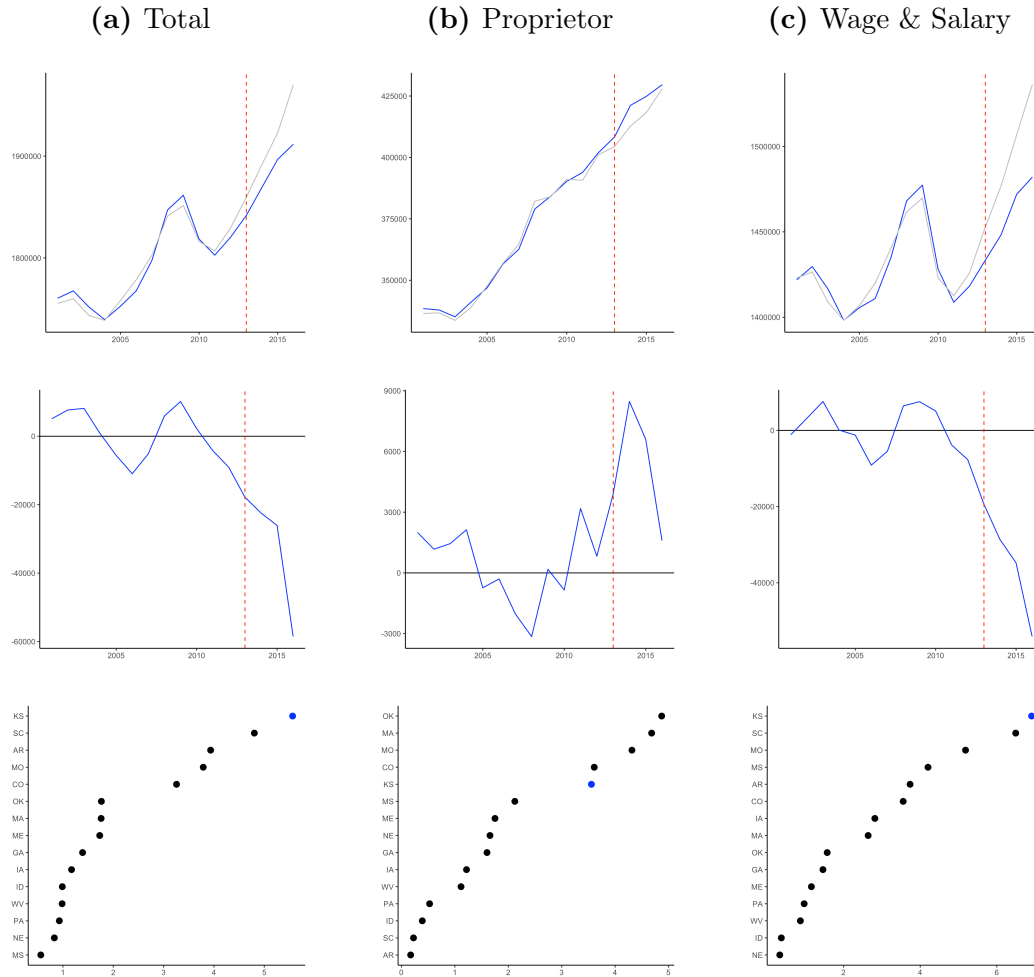
Dashed red vertical line marks the beginning of 2013 (policy effective date). Each column corresponds to a different variable. The graphs within each column depict: (1) actual and synthetic comparison (blue depicts Kansas, gray depicts estimated synthetic Kansas), (2) gap between actual and synthetic, and (3) distribution of RMSPE ratios obtained from placebo analysis (post and pre intervention RMSPE and ratio using the same approach as shown in prior results. Kansas is omitted from the donor pool for placebo analysis). Column (a) shows the BEA total employment measure. Column (b) shows the proprietor portion of total employment. Column (c) shows the wage and salary portion of total employment. Source: Annual Gross Domestic Product (GDP) by State, BEA.

Table 4: Total Employment, Proprietor Employment, Wage & Salary Employment - Synthetic Control Results

	Total	Proprietor	Wage & Salary
Average Treatment Effect	-35,683	5,559	-39,182
Dynamic Treatment Effect			
2013	-22,428	8,471	-28,648
2014	-26,071	6,604	-34,781
2015	-58,550	1,603	-54,117
RMSPE			
Pre	7,047.014	1,762.973	5,885.849
Post	39,203.69	6,269.978	40,657.38
Ratio	5.5632	3.5565	6.90765
Empirical RMSPE Ratio P-value	.2	.33	.067

Synthetic control weights were obtained using the R package Synth. The pre-intervention period is 2001 to 2011. The post-intervention period is 2013 to 2015. See main text and appendix for additional measure details. Average treatment effect is computed for 2013 to 2015. Dynamic treatment effects are computed for the year indicated. Pre-RMSPE is computed for the pre-intervention period (2001 to 2011). Post-RMSPE is computed for the post-intervention period (2013 to 2015). See main text for formulas. P-value reported is based on the distribution of placebo RMSPE ratios for all states in the donor pool. Kansas was not included in the donor pool for computing reported placebo effects.

Table 5: Difference-in-Difference Estimates

	RGSP	Emp	NES	Est
$KS \times Post$	-1,216.2	-16,824	-1,034.9	-3,120.35**
	(1,298.4)	(17,690)	(3,278.3)	(983.84)
$KS \times 2013$	-962.85	-12,451	-100.27	-2,149.94*
	(1,061.63)	(22,411)	(2,720.47)	(805.51)
$KS \times 2014$	-1,535.58	-13,683	-1,326.27	-3,075.69**
	(1,450.54)	(18,825)	(3,437.74)	(1,022.87)
$KS \times 2015$	-1,150.25	-24,338	-1,678.27	-4,135.44*
	(1,451.73)	(13,683)	(3,959.85)	(1,663.06)

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.

Table 6: State Level Migration Data

Out		In		In - Out
2011 to 2012				
KS → MO	9,601	MO → KS	9,450	-151
KS → OK	2,932	OK → KS	2,275	-657
KS → CO	2,294	CO → KS	1,726	-568
KS → NE	1,180	NE → KS	1,181	1
KS → IA	729	IA → KS	731	2
Total Out	42,718	*Total In*	39,256	-3,462
2012 to 2013				
KS → MO	10,270	MO → KS	10,042	-228
KS → OK	3,139	OK → KS	2,338	-801
KS → CO	2,543	CO → KS	1,790	-753
KS → NE	1,311	NE → KS	1,316	5
KS → IA	832	IA → KS	738	-94
Total Out	45,018	*Total In*	40,242	-4,776
2013 to 2014				
KS → MO	9,637	MO → KS	9,644	7
KS → OK	2,834	OK → KS	2,163	-671
KS → CO	2,542	CO → KS	1,670	-872
KS → NE	1,271	NE → KS	1,131	-140
KS → IA	721	IA → KS	730	9
Total Out	42,343	*Total In*	37,035	-5,308
2014 to 2015				
KS → MO	7,191	MO → KS	6,831	-360
KS → OK	2,010	OK → KS	1,736	-274
KS → CO	1,846	CO → KS	1,190	-656
KS → NE	828	NE → KS	777	-51
KS → IA	448	IA → KS	463	15
Total Out	30,020	*Total In*	26,943	-3,077

Source: IRS. Households filing a return in the origin state in the first year, and in the destination state in the second year. Totals are total migration, U.S. and foreign.

Appendix A: Tax Policy Change Details

The 2012 reform was followed by additional changes in 2013, 2014, 2015, and 2017. This appendix identifies many of the changes. As mentioned in the main text, the major 2012 changes were to the individual income rates, and the business income exclusion. Both are discussed in turn. Other changes were to the state sales tax, and the severance tax. A partial time line beginning with 2012 and legislative references can be found at the end of this Appendix. Subsequent changes were not as substantial as the original changes, but are nevertheless potentially confounding and important for interpreting estimates.

Individual Income Tax Changes

Table A1 compares features of the individual income tax in Kansas before and after the 2012 reform. The legislation collapsed the upper two brackets into one, and decreased the applicable rates for the two remaining brackets. The lower rate dropped from 3.5 percent to 3 percent. The upper rates dropped from 6.25 percent and 6.45 percent to 4.9 percent. Standard deductions for married filing joint and head of household taxpayers were initially increased, respectively, from $6,000 and $4,500 to $9,000. Legislation passed and taking effect in 2013 reduced both from $9,000 to $7,500 - still an increase relative to their pre-reform levels.

Table A1: Individual Income Tax Changes

2012			
	Individuals	Married Filling Joint	Rates
Brackets & Rates	≤ $15,000	≤ $30,000	3.50%
	>$15,000 & ≤ $30,000	>$30,000 & ≤ $60,000	6.25%
	>$30,000	>$ 60,000	6.45%
Standard Deductions	Single	$3,000	
	Married Filing Joint	$6,000	
	Head of Household	$4,500	
2013			
	Individuals	Married Filling Joint	Rates
Brackets & Rates	≤ $15,000	≤ $30,000	3.0%
	>$15,000	>$30,000	4.9%
Standard Deductions	Single	$3,000	
	Married Filing Joint	$9,000 (* $7,500)	
	Head of Household	$9,000 (* $5,500)	

Policy architects envisioned the 2012 reform as a step along the path to zero – zero being the ultimate goal for income tax rates. Legislation passed in 2013 scheduled additional individual income rate cuts, which were modified in 2015. Table A2 provides details. The scheduled rates based on the 2013 legislation are shown in the upper two rows. The bottom two rows show the scheduled and effective rates enacted by the 2015 legislation.

Table A2: Scheduled Future Rate Cuts

		2013	2014	2015	2016	2017	2018
2013	Lower Bracket	3.0%	2.7%	2.7%	2.4%	2.3%	2.3%
	Upper Bracket	4.9%	4.8%	4.6%	4.6%	4.6%	3.9%
2015	Lower Bracket			2.7%	2.7%	2.7%	2.6%
	Upper Bracket			4.6%	4.6%	4.6%	4.6%

The 2012 legislation also reduced and eliminated a number of deductions and credits, and charted a course for partially phasing out itemized deductions. In both cases, the specifics were modified by later legislation. Modifications to the deduction and credit changes were made in 2013 and in 2014. Details, along with a general policy time line, are provided in Table A4. The itemized deduction phase out was accelerated in 2015. Table A3 shows the scheduled changes in effect as of 2013, and as of 2015. Charitable contributions were not subject to the phase out.

Table A3: Scheduled (Partial) Phase Out of Itemized Deductions

		2013	Limit to 70% of federal return excluding SALT.
	2013	2014	Limit drops to 65% and no wagering losses.
		2015	Limit drops to 60%.
		2016	Limit drops to 55%.
		2017	Limit drops to 50%.
2015	2015		100% Section 170 Charitable Contributions 50% Section 163(h) Qualified Residence Interest 50% Section 164(a) Real and Personal Property

Individual Business Income Exclusion

Kansas individual income tax liability, like federal individual income tax liability, depends on a taxpayer's adjusted gross income (AGI). Kansas AGI

is determined by applying adjustments to a taxpayer's federal AGI.[29] The 2012 legislation enacted a new set of adjustments, in effect broadly exempting certain types of income from the Kansas individual income tax:

> "(c) There shall be subtracted from federal adjusted gross income:
> ...
> For all taxable years beginning after December 31, 2012, the amount of any: (1) Net profit from business as ... reported ... on line 12 of the taxpayer's form 1040 federal individual income tax return; (2) net income from rental real estate, royalties, partnerships, S-corporations, estates, trusts, residual interest in real estate mortgage investment conduits and net farm rental as ... reported ... on line 17 of the taxpayer's form 1040 ... ; and (3) net farm profit as ... reported ... on line 18 of the taxpayer's form 1040 ... "[30]

Income reported on lines 12, 17, and 18 is associated with schedules C, E, and F. Corresponding changes were enacted to prevent offsetting losses. In 2015 the exclusion was limited by bringing guaranteed payments back into adjusted gross income. The Kansas Legislative Research department estimated that taxing guaranteed payments would increase SGFs by 23.7 million in fiscal year 2016, by 19.2 million in fiscal year 2017, and by 20.1 million in fiscal year 2017.[31]

Corporations benefited from a series of rate cuts phased in from 2008 to 2011. In particular, 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 (KSA 79-32,110(c)). Corporate franchise tax rate reductions were phased in over the same period, and the applicability threshold was increased (KSA 79-5401).

Sales Tax Changes

Legislation enacted in 2010 increased the state sales and use tax rate from 5.3 to 6.3 percent. That 2010 legislation scheduled the rate to drop down to 5.7 percent on July 1, 2013. Intervening legislation enacted in 2013 reduced the scheduled decrease so that on July 1, 2013 the rate decreased to 6.15 percent.

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[29] K.S.A. 79-32,117(a). And Kansas taxable income is Kansas AGI minus Kansas deductions and Kansas personal exemptions. K.S.A. 79-32,116.

[30] HB 2117, Section 12; K.S.A. 79-32,117(c)(xx).

[31] Kansas Legislative Research Department, 2015 Summary of Legislation, HB 2109.

In 2015, the rate was increased to 6.5 percent. Table A4 summarizes recent state sales tax rates and the date they took effect.

Table A4: Sales and Use Tax Rate Changes

2002	5.30%
July 1, 2010	6.30%
July 1, 2013**	6.15%
July 1, 2015	6.50%

Summary and References

Table A5 begins to list various changes in the year they were made.

Table A5: Partial Time Line of Tax Related Changes Enacted in Kansas

2012	Eliminate Credit for Child & Dependent Care Expenses Eliminate Disabled Access Credit Eliminate Adoption Credit Eliminate National Guard Employer Health Insurance Credit Eliminate Law Enforcement Training Center Credit Eliminate subtraction mod for LT care insurance payments (up to $1,000) Eliminate food sales tax refund Reduce homestead property tax refund *Plus* eliminate other business related credits
2013	Partially restore food sales tax refund (as a nonrefundable credit)
2014	Reenact Adoption Credit Reenact Disabled Access Credit
2015	Guaranteed payments back in income Freeze individual income rates for TY 2015-2017 Amend trigger reduction provisions in effect after 2020 Accelerate phase out of itemized deductions Low income exclusion ($< 5,000$ single,$< 12,500$ mfj) Increase state sales and use tax

Table A6 contains some of the relevant legislation references.

Table A6: Legislation References

Session	Bill	Enacted	Effective	Applicable
2012	HB 2117	May 22, 2012	July 1, 2012	2013
2013	SB 83	April 16, 2013	April 25, 2013	2013
2013	HB 2059	June 13, 2013	June 20, 2013	2013
2014	SB 265	April 17, 2014	July 1, 2014	2013, 2014
2015	HB 2109	June 16, 2015	July 1, 2015	2015, 2016
2015	SB 270, HB 2142		July 1, 2015	

Appendix B: Data Sources and Definitions

Additional information on variables used are grouped by data source. Descriptions below are based on information provided by the original data source.

County Business Patterns (CBP), U.S. Census Bureau

CBP is produced annually by the Census using both administrative and survey data sources. State-level releases are used.

Employment includes paid employment, full-time and part-time, based on payroll in the pay period covering March 12. Salaried officers and corporate executives are included, but self-employed individuals, proprietors, and partners of unincorporated businesses are not included. Certain industries are not covered. In particular, most private household, agricultural, and government employment is excluded.

Establishments are fixed physical locations or structures where business activity is conducted under common ownership. Locations are based on Economic Census, Company Organization Survey, and administrative record data.

Entity type is based on legal form of organization (LFO). LFO breakdowns in the original data are: (1) corporation, (2) s-corporation, (3) sole proprietorship, (4) partnership, (5) non-profit, (6) government, and (7) other. This paper uses corporate and noncorporate entity type breakdowns. Corporate is from corporation. Noncorporate aggregates s-corporation, sole proprietorship, partnership, and other. Non-profit and government are not included in analysis comparing corporate and noncorporate.

Industry Classifications, Multiple Sources

Industry classifications are based on two-digit level NAICS code. Data series used in this paper cover 1998 to 2015. Applicable industry classification changed approximately every five years during that period potentially impacting comparability of data over time (the data spans NAICS 1997, NAICS 2002, NAICS 2007, and NAICS 2012). This is not believed to be a major issue at the two-digit level.

Annual Gross Domestic Product by State, Bureau of Economic Analysis

Real GDP by state (RGSP) is measured in 2009 chained dollars. Inflation-adjustment is based on national prices. The measure is constructed by the

BEA using an earned factor income and cost of production approach.

Private Sector RGSP is constructed by subtracting real GDP in the public administration sector from the total state RGSP. The public administration sector is identified using NAICS code 92. This will exclude state, local, and federal contributions to RGSP.

Nonemployer Statistics, U.S. Census Bureau

Nonemployers are businesses with no paid employees or payroll, who are subject to federal income taxes, and have receipts of $1,000 or more ($1 for the construction sector). An editing process removes firms not thought to be 'true nonemployers.' Data are produced from business income tax records. Location is based on administrative record mailing address of owner, which may differ from business location.

State Personal Income Accounts, Bureau of Economic Analysis

Total employment includes full-time and part-time jobs, wage and salary jobs, sole proprietorships, and individual general partners.

Wage and salary employment measures average annual full-time and part-time jobs, counting all jobs for which wages and salaries are paid.

Proprietor employment farm proprietor and nonfarm proprietor employment.

Population, U.S. Census Bureau

Population estimates following 2010 reflect the most recently available Census estimates (2017 vintage). Intercensal estimates are used for all other years (unless variables are from components of change). Estimates are of the population as of July 1st.

Prime age male is constructed as the share of the total state population who are male and age 25 to 54. It is computed by adding the population values for male in the associated age categories, and dividing that by the total population.

Population density

Rural population is based on 2010 Census counts.

Current Population Survey, Bureau of Labor Statistics and U.S. Census Bureau

Individual-month level data was obtained from Cadre at the Kansas City Federal Reserve Bank. State-year level aggregates were computed by adding across individuals within each state (applying weights), and averaging across months within each year.

Education level measures are based on individuals reported highest level of completed education. Measures used in this paper were (1) *high school or lower education*: the number reporting high school degree or lower as their highest completed level as a share of the population, and (2) *bachelor or higher education*: the number reporting a bachelor degree or higher as their highest completed level of education as a share of the population. In both cases, shares were computed from the total population from which education was reported.

Skill level are measured based on the occupation of a workers primary job. All are divided into low, middle, or high. (Additional details available upon request). Numbers reported in this paper represent the number of employed individuals in a particular skill category over the total number of employed individuals. *Middle skill workforce* is the share of workers with middle skill level primary occupation.

Labor force participation rate is the number of individuals either employed or unemployed over the adult civilian non-institutionalized population.

Unemployment rate is the number of individuals unemployed over the number of individuals in the labor force.

Quarterly Summary of State and Local Government Revenue, U.S. Census Bureau

Quarterly values are added to get calendar year annual numbers.

State Level Tax Rates, Tax Foundation

Top corporate and individual income tax rates, and general sales tax rates at the annual state level were collected from multiple Tax Foundation spreadsheets.

Personal Consumption Expenditures (PCE) by State, Bureau of Economic Analysis

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